S-NA-L

MUS. COMP. ZOOL.
LIBRARY
JUN 9 1973
HARVARD
UNIVERSITY

A COASTAL CHUMASH VILLAGE: EXCAVATION OF SHISHOLOP, VENTURA COUNTY, CALIFORNIA

ROBERTA S. GREENWOOD and R. O. BROWNE

Appendix A
FISH REMAINS, PRIMARILY OTOLITHS,
FROM A VENTURA, CALIFORNIA,
CHUMASH VILLAGE SITE (VEN-3)
JOHN E. FITCH

Appendix B
FURTHER EXCAVATION OF VEN-3
ROBERTA S. GREENWOOD and R. O. BROWNE

MEMOIRS OF THE
SOUTHERN CALIFORNIA ACADEMY OF SCIENCES
VOLUME 8
October 1, 1969

A COASTAL CHUMASH VILLAGE: EXCAVATION OF SHISHOLOP, VENTURA COUNTY, CALIFORNIA

Figure 1. View of Shisholop about 1905. Early photograph of the point of land containing the site Ven-3 and general area, loaned by Mrs. Mary Louise Canet.

A COASTAL CHUMASH VILLAGE: EXCAVATION OF SHISHOLOP, VENTURA COUNTY, CALIFORNIA

ROBERTA S. GREENWOOD and R. O. BROWNE

Appendix A
FISH REMAINS, PRIMARILY OTOLITHS,
FROM A VENTURA, CALIFORNIA,
CHUMASH VILLAGE SITE (VEN-3)
JOHN E. FITCH

Appendix B
FURTHER EXCAVATION OF VEN-3
ROBERTA S. GREENWOOD and R. O. BROWNE

MEMOIRS OF THE
SOUTHERN CALIFORNIA ACADEMY OF SCIENCES
VOLUME 8
October 1, 1969

MEMOIRS OF THE SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

The MEMOIRS of the Southern California Academy of Sciences is a series begun in 1938 and published on an irregular basis thereafter. It is intended that each article will continue to be of a monographic nature, and each will constitute a full volume in itself.

Contributions to the MEMOIRS may be in any of the fields of science, by any member of the Academy. Acceptance of papers will be determined by the amount and character of new information and the form in which it is presented. Articles must not duplicate, in any substantial way, material that is published elsewhere. Manuscripts must conform to MEMOIRS style of volume 4 or later, and may be examined for scientific content by members of the Publications Committee other than the Editor or be sent to other competent critics for review.

Because of the irregular nature of the series, authors are urged to contact the Editor before submitting their manuscript.

Donald J. Reish
Editor

Communications concerning the purchase of the Memoirs should be directed to the Treasurer, in care of the Los Angeles County Museum of Natural History, Exposition Park, Los Angeles, California 90007. Communications concerning manuscripts should be directed to Donald J. Reish, Dept. of Biology, California State College at Long Beach, Long Beach, California. 90804.

Printed by Anderson, Ritchie & Simon, Los Angeles, California

CONTENTS

INTRODUCTION	1
History	1
Acknowledgments	4
Description of the site	6
Excavation	8
Burial	8
Features	9
STONE ARTIFACTS	12
Flaked stone	12
Ground, polished, and pecked stone	21
Steatite	26
SHELL ARTIFACTS	27
Beads	27
Ornaments	31
Fishhooks	32
Containers	34
BONE ARTIFACTS	35
OTHER ABORIGINAL REMAINS	39
NON-ABORIGINAL ARTIFACTS	41
MIDDEN ANALYSIS	45
CONCLUSIONS	47
LITERATURE CITED	54
Appendix A: Fish Remains, Primarily Otoliths, From a Ventura, California, Chumash Village Site (Ven-3), by John E. Fitch	56
Appendix B: Further Excavation of Ven-3, by Roberta S. Greenwood and R. O. Browne	71

A COASTAL CHUMASH VILLAGE: EXCAVATION OF SHISHOLOP, VENTURA COUNTY, CALIFORNIA

ROBERTA S. GREENWOOD[1] AND R. O. BROWNE[2]

ABSTRACT: Archaeological excavations were undertaken in 1965 on the waterfront at Ventura, California, at the site designated as Ven-3. Cabrillo had visited this village in 1542 and named it Pueblo de las Canoas, and later sea and land explorers have also left descriptions. It was said to be a capital of the Chumash Indians who called it Shisholop. Historical records are reviewed. The site was probably settled about A.D. 1000, reached its maximum development about 1500, and declined rapidly in the early Mission period.

Artifacts of shell, stone, and bone are analyzed, and food remains identified. Within the aboriginal assemblage, shell items predominate, followed by flaked stone tools. Two features, one burial, and 31 pottery fragments are described. Cultural affinities to other Chumash sites are suggested.

Appendix A presents the first effort to use intensive collection and identification of fish otoliths as an aid to archaeological research. The study yielded a list of 45 fish species, plus implications about Indian fishing methods. Together with data from the shell analysis, comparison of net edible proteins indicates that fish were more important in the Chumash diet than molluscs.

Appendix B describes further excavation of a portion of the same site which became available to study in 1967. Additional artifacts were recovered, two more stone features, and one additional species of fish. Both the artifact collection and the midden analysis confirm that this area was a homogeneous part of the same site.

Review of the coastal erosion within the last millennium reveals that what remained to be excavated at Shisholop was actually only the northernmost remnant of the village. Since the recovery of artifacts and food remains, even in this peripheral area, was higher than that in other Chumash sites, the excavations validated the size and importance of Shisholop as reported in the early historical accounts.

INTRODUCTION

History

Historical records concerning the Indians who lived on the Ventura coast begin with the diary of the voyage of Juan Rodriguez Cabrillo. The pilot Ferrel has left fairly detailed notes of the route which Cabrillo's two ships followed from the time they left the port of Barra de Navidad in Mexico on June 27, 1542, until their return in the following April. One of the early translations, with notes by H. W. Henshaw (Wheeler, 1879: 306) includes this description:

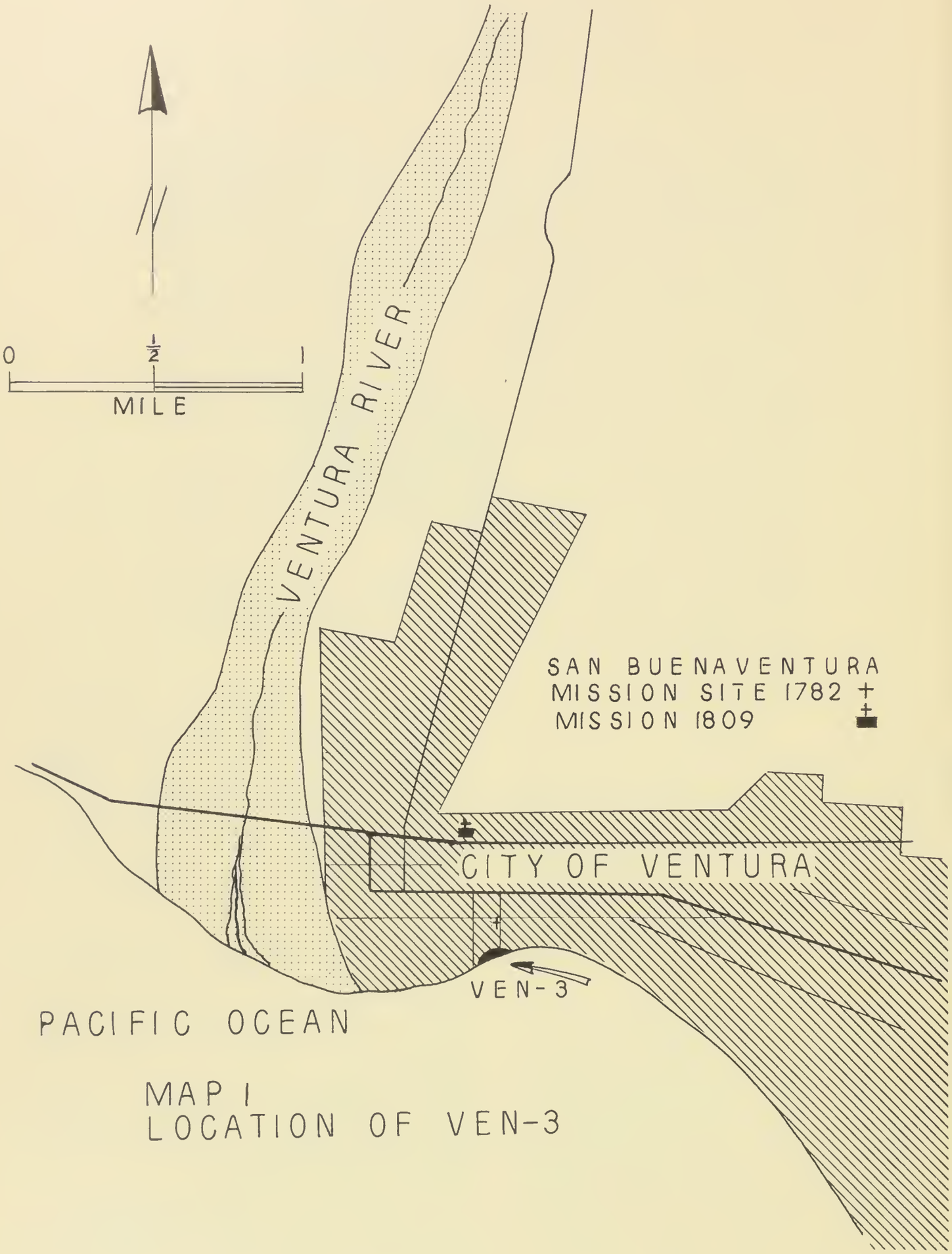
> "The following Monday, on the 9th day of the said month of October, they departed from la Bahia de los fuegos [Santa Monica], and proceeded this day about 6 leagues, and anchored in a large inlet [Point Mugu], and they passed on thence the following day, Tuesday, and proceeded about 8 leagues on a coast northwest and southeast, and we saw on the land a village of Indians near the sea, and the houses large in the manner of those of New Spain; and they anchored in front of a very large valley on the coast. Here came to the ships many very good canoes which held in each one twelve or thirteen Indians . . . They gave name to this village of el Pueblo de las Canoas. They go covered with some skins of animals; they are fishers and eat the fish raw; they also eat agaves. This village is in 35⅓ degrees. The country within is a very beautiful valley, and they made signs that there was in that valley much maize and much food. There appear within this valley some sierras very high, and the land is very rugged. They call the Christians Taquimine. Here they took possession; here they remained until Friday, the 13th day of the said month."

Bancroft (1884) differs with Henshaw in the correlation of Santa Monica and Point Mugu with the places described in the Cabrillo account, but accepts without question the location of Pueblo de las Canoas in Ventura. Other historians agree (Engelhardt, 1930; Hoover and Rensch, 1932), although Kroeber (1925) points out certain repetitions, misspellings, and confusions in the great navigator's account and suggests that Canoas was more likely at Rincon. He maps the Chumash village at Ventura as Shisholop.

There is further confusion concerning the native place name of Xucu or Shuku. According to two translations of the Cabrillo log (Wheeler, 1879;

[1]Research Associate in Archaeology. Los Angeles County Museum of Natural History 90007

[2]30 La Cumbra St. Oak View, California 93022



MAP 1
LOCATION OF VEN-3

Moriarty and Keistman, 1963), Xucu is given both as the native name for Canoas and for the province which extended from this village westerly to Goleta (Pueblo de las Sardinas or Cicacut). Compounding confusion, Kroeber (1925: 553 and Plate 48) places a second Shisholop at Point Conception, identifying this settlement with Xexo — itself a name for both a village and the adjacent province extending from Goleta to Conception.

The second navigator to visit the Ventura village did not call it by name but added further description of the inhabitants. In December of 1602, Sebastian Vizcaino wrote (Bolton, 1908: 87-8):

> "So we went on skirting the coast, and on Monday, the 2d of the said month, we sighted two other large islands. Passing between the first and the mainland, a canoe came out to us with two Indian fishermen, who had a great quantity of fish, rowing so swiftly that they seemed to fly. They came alongside without saying a word to us and went twice around us with so great speed that it seemed impossible; this finished, they came aft, bowing their heads in the way of courtesy. The general ordered that they be given a cloth, with bread. They received it, and gave in return the fish they had, without any pay, and this done they said by signs that they wished to go. After they had gone five Indians came in another canoe, so well constructed and built that since Noah's Ark a finer and lighter vessel with timbers better made has not been seen. Four men rowed, with an old man in the centre, [singing] as in a *mitote* of the Indians of New Spain, and the others responding to him. Before coming alongside they stopped and he saluted us three times, making many ceremonious gestures with his head and body, and ordering the Indians to row around. This was done so swiftly that in a moment they went around us twice and immediately came aft. Only the old man spoke, he saying by signs that we must go to his land, where they would give us much food and water, for there was a river. He gave us a flask of it which he had brought, and a willow basket of food, a sort of porridge made of acorn meal."

The next expedition to pass the village was dispatched in 1769 by Don Joseph de Galvez, inspector-general of Lower California, to search for Monterey Bay, previously discovered by Vizcaino in 1602, in order to establish there both a Mission and a military garrison. There were three diarists among the company: Gaspar de Portola, the commander; the Franciscan Father Juan Crespi; and Miguel Costanzo, the expedition engineer. The writers agree that the village then contained about 30 round, thatched houses and a population of 300-400 persons. The boats were described as eight yards long and one yard wide, made of good pine planks fastened with cords and caulked with tar. The natives used long double-bladed paddles to row with great speed and agility. Costanzo recognized the community as Pueblo de Canoas, although the Portola party renamed it La Asuncion de Nuestra Senora, or La Asumpta, because they reached it on the eve of that feast (Engelhardt, 1930).

Juan Bautista Anza journeyed past the village twice, in 1774 and 1776, on trips from the south to Monterey. On the second march, he was accompanied by Fr. Pedro Font as official chronicler, and Font has left a lengthy description of the settlement. Although Fr. Crespi had originally proposed this location for the establishment of a Mission in 1769 and Fr. Presidente Junipero Serra had assigned friars in 1771, various problems and obstacles delayed the actual founding of Mission San Buenaventura until 1782 (Engelhardt, 1930). The original structure, no longer standing, was erected at the southwest corner of present Meta and Palm Streets, about 900 feet due north of the archaeological site.

According to the Mission Registers, the following were among the Indian rancherias which contributed neophytes: Chucu, Chicholop, Sisa, Solop, Lolopp, and Sisolop (Engelhardt, 1930) — any or all of which may refer to the beach village under consideration here. In a map contained in a volume of the letters of Fr. Jose Senan, who served the Mission from 1797 to 1823, the name Shisholop appears in the appropriate location (Nathan and Simpson, 1962).

The records of vital statistics maintained by the Mission show that between the years 1784-1805, there were 207 baptisms and 34 marriages performed for Indians of "Sicolop alias San Buenaventura." This spelling was consistent for this period, the variants appearing later. It should be mentioned that the total for baptisms is not any indication of the birth rate since most of the ceremonies represented adult conversions. Even allowing for language barriers, there is evidence of considerable longevity; 36 of the neophytes were over 60 years of age, 21 of them were over 70, 12 were over 80, and two had passed 90 years (San Buenaventura Mission, *passim*).

The name of Shisholop does not appear in the ceremonial calendar after 1805, even though the Mission proper continued to grow until it reached its peak population of 1,328 in 1816 (Engelhardt, 1915). Since 36 adobe houses were built in 1804 "to be used as dwellings for the many neophyte families" and 29 more were constructed in 1805 (Engelhardt, 1930), it is possible that the independent life of the beach community ended in the latter year with the removal of the remaining Indians to the Mission compound. The Mission

itself was to decline rapidly during the third decade; a map drawn in 1823 gives the population of San Buenaventura as 352, and the Indian village no longer appears (Narvaes, 1823).

The identification of the site Ven-3 with Shisholop and Pueblo de las Canoas seems firmly established through the above records and from information gathered in 1884 by Henry W. Henshaw (Heizer, 1955). At that time, Henshaw found about 20 Chumash individuals in Ventura, the largest remaining native settlement. His informant, Juan Estevan Pico, identified Shisholop as existing "frente a la calle de Fezueroa" and told Henshaw that it was a capital or important town where festivals, feasts, and perhaps councils were held. Henshaw's phonetic spelling, from Pico's pronunciation, is recorded as Cí-câ-lâp. Another reference is in the so-called Candalaria Account taken down in 1914 from an aged respondent, supposedly one of the last of the Ventureno Chumash. She recalled, "Near the wharf at Ventura there was once a rancheria on a high bank fronting the sea called *Schi schlo lop*" (Blackburn, 1963).

Acknowledgments

The archaeological site variously called Shisholop, Pueblo de las Canoas, and Ven-3, has been known to the Spanish since 1542, to local relic collectors for generations, and to the University of California at Los Angeles since a site report was filed in 1948, but it continued to erode away through the ravages of human and tidal action until the spring of 1965. At that time the city of Ventura and the Urban Renewal Agency announced plans for various constructions and alterations along the waterfront, and the need to study what remained of this site took on the aspects of an emergency salvage project.

Once the situation and supporting data were set forth, Agreement No. 4-022-023 was quickly arranged between the California Division of Beaches and Parks and the Central California Archaeological Foundation (CCAF) to sponsor and support the research. Francis A. Riddell, for the former agency, and Eugene Lutes, secretary-treasurer of the CCAF, deserve full credit for arranging this contract as promptly and as generously as possible. Permission was graciously granted by the Canet Company to excavate the eastern one-third of the site which extends into their property.

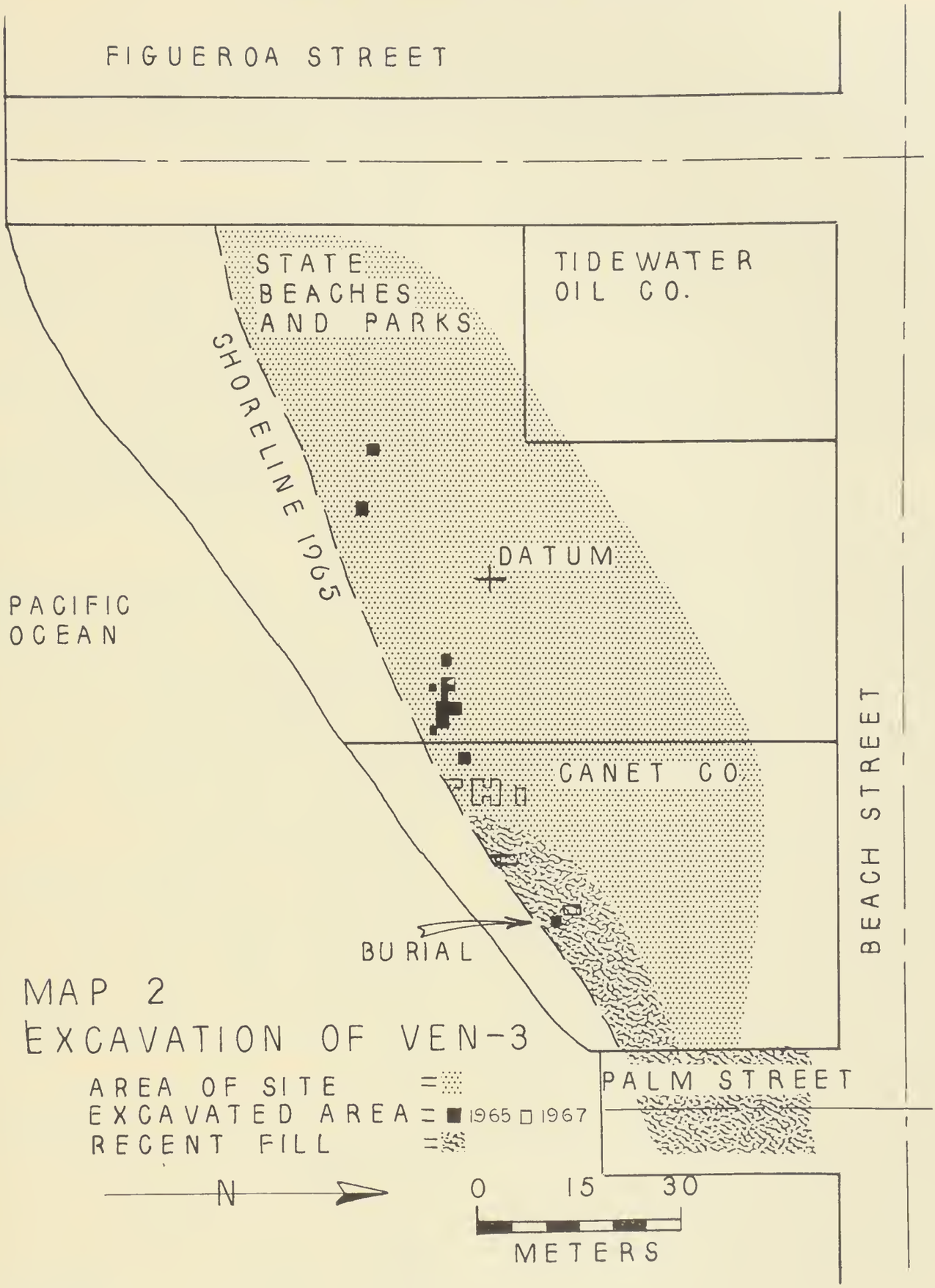
Since the grant of funds was not sufficient for payment to crew members, all field and laboratory assistance was voluntary. Needless to say, the volume of work accomplished could not have been done without this dedicated help, and the obligations of gratitude incurred are beyond expression. Mrs. Myrle Kirk of Ventura was a valued and loyal associate in every aspect of the research; after the field work was completed, she and Mrs. Linda Browne of Oak View spent additional weeks performing important but tedious laboratory sorting and analysis. William Kirk not only loaned his wife to the project, but spent his own spare time and weekends on the site and constructed or contributed many useful supplies. Other residents of Ventura and neighboring communities whose assistance in the field is gratefully acknowledged are John S. Hook, Mrs. Katherine Heath, Mrs. Jackie Kelly, Ralph Looman, Allen King, Al Pruitt, Jim Shackelford, Edward Eden, Peter Jump, Mrs. Claredith Bogner, Mrs. Ouida Phillips, and John Borel.

The Archaeological Survey Association of Southern California designated the site as an official field trip for the weekend of August 7-8, 1965, and the cooperation and assistance of the large delegation is warmly appreciated. Miss Maida Boyle brought her anthropology class from Los Angeles City College to help on August 8. Mrs. Freddie Curtis assumed full responsibility for two of the pits which she subjected to a minute and painstaking midden analysis. The authors thank and commend her for this meticulous effort in the field and laboratory.

This report is greatly enhanced by the contributions of John E. Fitch, Research Director, Marine Resources Operations, California State Fisheries Laboratory. Mr. Fitch not only identified the otoliths, shells, and some fish bone from the excavation, but volunteered to process additional soil samples himself to recover otoliths too small to be caught in archaeological screens. He presents his methods and conclusions in the Appendix, which constitutes a noteworthy addition and refinement of research technique.

Several individuals made available to the project private collections which they had previously made on the site. Ralph Looman and Anthony Borysewicz donated their finds, and the following permitted us to examine, record, and photograph their collections: Mrs. Jackie Kelly, Mrs. Claredith Bogner, Miss Valarie Bogner, Mrs. Bea La Brum, and Alan Matthews. These artifacts are reflected in the charts in the column titled Surface.

Mr. James Conner, Asst. Park Supervisor, San Buenaventura Beach State Park, and all his crew did everything possible to assist the work. Through the cooperation of Chief Ranger Markle and Mr. Robert B. Deering, Regional Supervisor at the Goleta office, the field party was permitted to camp on the site, and Parks personnel erected barricades to protect the excavations, did the back-filling with



power equipment, and kept a friendly, watchful eye on the proceedings.

Dr. Charles Rozaire, Curator of Archaeology, Los Angeles Museum of Natural History, made available not only certain items of field equipment but, more important, his expert advice on the basketry impressions in asphaltum. Dr. Mildred E. Mathias, Professor of Botany, University of California, Los Angeles, kindly identified burned seeds. Mr. Richard Humphrey, Department of

Anthropology at the Santa Barbara campus of the University, has graciously examined several boxes of rusty nails, broken dishes, and assorted historical odds and ends. Mr. Carlton Carson, Ventura geologist, took core samples through the midden down to 140 cm, and advised on the nature of the base stratum.

Mr. W. 1. Follett, Department of Ichthyology, California Academy of Sciences, San Francisco, has most generously agreed to identify the fish remains as soon as his crowded schedule permits. He has already verified the origin of certain artifacts made of fish bone.

The collection has been deposited at the Los Angeles County Museum of Natural History as Accession No. L. 2616.69-1-658.

Description of the Site

The archaeological deposit is located in the city and county of Ventura, California, bounded on the north by Beach Street, on the east by Palm Street, on the west by Figueroa Street, and on the south by the east-west trending ocean bluff (Maps 1 and 2). The area of intense occupation is approximately 120 meters east to west and averages 65 meters from north to south, bordering the beach. The co-ordinates are North 34° 17′ 40″, not an unreasonable error in Cabrillo's navigation, and West 119° 17′ 40″.

The site is on a recent marine terrace mixed with relatively recent riverine alluvium. The basic land formation consists of lower Pleistocene and uppermost Pliocene marine deposits (San Pedro and Santa Barbara formations). These overlay Pliocene marine sandstone, shale, and conglomerate, which in turn rest upon Miocene marine strata, mostly organic shale (Santa Margarita, Monterey, Rincon, and Vaqueros formations) (Bailey, 1953). Analysis of core samples taken with a two-inch auger down to 140 cm revealed that the base at that depth is a marine terrace, at least 10,000 years old, with some admixture of older riverine fossils.

It should be emphasized that the area studied is perhaps less than one-third of the original habitation site, and the peripheral northern fraction at that (Map 3). The shoreline has undergone substantial erosion since the time of Indian occupation. A municipal plat map of 1868 shows an additional city block extending seaward from the present water line, establishing a loss of 150 feet of land within the century. The bluff has eroded more than five feet during the one year the site has been under observation: the rate of attrition is accelerating, partly due to increasing public use of the beach as well as more complicated geologic factors. An extension of the more or less circular boundary of the midden area would place the original southern edge of the site more than 300 feet out to sea. Then, as now, the site probably faced an exposed, outer coast with a relatively rock-free, sandy beach.

The site is about one-half mile east of the present mouth of the Ventura River. Although the average annual rainfall of the vicinity is about 12 inches, 78 per cent of it occurring from December to March (Hyatt, 1933), the river has always had a sufficient volume and rate of flow to hold its own against the uplift athwart its course (Livingston and Putnam, 1933). Within the memory of some of the older residents of the area, the stream had sufficient water to support a good population of large salmon and steelhead. There are indications that a slough once bordered the eastern margin of the site (Map 3).

The Ventura River would have provided not only a constant source of fresh water, but ample cobble float material for artifacts. Less consolidated rock would have come from the contorted and folded sandstones and shales of the marine Modelo and Vaquero formations exposed at Devil's Gulch and Sulphur Mountain, and the Sespe formation at Red Mountain. The quartzite used for tools is a quartz-cemented sandstone, or granular secondary rock, common in Ventura County both *in situ* and as stream wash.

Among the cherts, the fine striped black and white material is a Miocene age Monterey formation common as outcrop. More frequently encountered among the artifacts were the black, brown, or green cherts which are chemically deposited and locally plentiful in the stream bed. The translucent chalcedony is a common opal vein-filling mineral which occurs in a large outcrop near Camarillo.

Fused shale may be found in the Sespe formation at Grimes Canyon about 30 miles to the east. Serpentine occurs in the Figueroa Mountain region of Santa Barbara County, and quartz crystals in the Conejo area of Ventura County. Hematite is particularly plentiful near Point Sal, while limonite is present in most soils. There are numerous sources of asphaltum in the immediate vicinity of the site. Although there are mainland sources for steatite in Ventura and Santa Barbara counties, the material used for artifacts appears to be the variety typical of Santa Catalina Island deposits.

The area of the site has been denuded of all vegetation for many decades if not centuries, but in aboriginal times, it would have been favorably endowed with a multitude of usable plants. It is

TABLE 1
Total Artifact Recovery
Depth in cm

Category	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	Surf.*	Total
Stone Artifacts												
Flaked Stone												
Proj. points	4	15	11	9	6	4	2	1	1	—	40	93
Blades	1	3	2	3	2	—	—	—	—	—	13	24
Choppers	—	2	2	2	1	—	—	—	1	—	1	9
Hammerstones	—	2	11	4	3	1	—	—	—	—	10	31
Knives	5	3	3	7	4	—	—	1	—	—	2	25
Scraper planes	—	2	4	1	—	—	—	—	—	—	1	8
Drills	5	20	23	6	2	2	1	2	—	—	19	80
Gravers	—	1	—	1	—	—	—	—	—	—	3	5
Pick	—	—	—	—	—	—	—	—	—	—	1	1
Scrapers, etc.	8	11	16	17	6	6	1	—	1	—	11	77
	23	59	72	50	24	13	4	4	3	—	101	353
Polished, Ground, and Pecked Stone												
Bowls	—	—	1	1	—	—	—	—	—	—	5	7
Small mortars	—	1	1	—	—	—	—	—	—	—	1	3
Milling stone	—	—	—	—	—	—	—	—	—	—	1	1
Mano	—	—	—	1	—	—	—	—	—	—	—	1
Pestles	1	3	1	4	—	—	—	—	—	—	8	17
Cobble bar tools	3	—	4	1	—	—	—	—	—	2	1	11
Steatite	5	7	2	4	1	2	—	—	—	—	5	26
Beads	—	1	2	—	—	—	—	—	—	—	6	9
Miscellaneous	1	1	2	1	3	1	1	—	—	—	2	12
	10	13	13	12	4	3	1	—	—	2	29	87
Shell Artifacts												
Beads	364	787	669	401	304	274	100	33	3	—	744	3,679
Ornaments	2	1	3	5	2	2	3	—	—	—	7	25
Fishhooks	2	6	11	7	6	6	4	1	—	—	3	46
Containers	—	—	2	1	1	—	1	1	—	—	1	7
	368	794	685	414	313	282	108	35	3	—	755	3,757
Bone Artifacts												
Awls	1	6	14	6	3	9	4	2	—	—	15	60
Punches	—	—	1	1	2	2	—	—	—	—	1	7
Flakers	—	—	1	1	2	1	2	—	—	—	5	12
Beads	2	1	3	3	1	1	—	—	—	—	2	13
Fishhooks	—	—	3	—	1	1	—	—	—	—	4	9
Miscellaneous	1	6	3	2	6	4	1	—	—	—	1	24
	4	13	25	13	15	18	7	2	—	—	28	125
Asphaltum												
Tarring pebbles	1	14	12	3	9	3	1	2	1	1	9	56
Miscellaneous	2	1	6	—	1	1	—	2	—	—	18	31
	3	15	18	3	10	4	1	4	1	1	27	87
Pottery	2	13	7	6	1	1	—	—	—	—	1	31
Quartz Crystals	—	2	1	2	—	—	—	—	—	—	—	5
Historic Artifacts												
Trade beads	20	36	19	9	4	2	1	1	—	—	51	143
Cut nails	97	182	25	18	1	—	—	—	—	—	4	327
Miscellaneous	297	482	51	13	3	1	1	—	—	—	4	852
	414	700	95	40	8	3	2	1	—	—	59	1,322
Totals	824	1,609	916	540	375	324	123	46	7	3	1,000	5,767

*Here and elsewhere throughout the report. Surface includes all private collections and objects gathered on the surface by the field party.

located where several associations were in close juxtaposition and thereby supplied a wide variety of flora. The oak-grass association of the interior valley would have yielded acorns, native grasses with edible seeds, bulbs, etc.; the stream bed supported a riparian association of trees, shrubs, and aquatic plants; while the south-facing hillsides were clothed with a coastal sage association of other low shrubs, annual herbs, and grasses.

Excavation

In order to verify and delimit the area of occupation, test borings were made with a two inch soil auger along a 50 foot grid east-west and a 25 foot grid north-south. The column samples were sorted and weighed, and the shell content plotted on a map. The area which contained the greatest amount of shell, 8 per cent, lay in a zone approximately 10 m wide parallel to the bluff. The shell content decreased to almost zero at the streets bordering the area. The greatest amount of shell was found within the top 30 cm from the surface, with the deposit extending in some places to and below 70 cm. The non-lithic component averaged 90 per cent shell and 10 per cent bone, much of the latter representing fish vertebrae.

Because of the rapid erosion of the ocean bluff and plans for the redevelopment of the waterfront area, it was considered safest to choose as a permanent datum the mid-point of the intersection of Palm and Beach Streets. For ease of measurement in staking out the excavation units, a secondary datum was surveyed 70 m west and 50 m south of this point, and an iron pipe sunk into the ground at this spot. Pit designations, i.e. East 10-South 4, refer to the distance in meters from the auxiliary datum (Map 2).

Excavations during the 18 days in the field were located within the areas of highest shell concentration, three pits in the westerly area and ten in the east. Each unit was one meter by two meters in size, and they averaged 70 cm in depth. In addition, four half-pits, one meter square, were subsequently opened in the eastern area — one for a special shell sample to be submitted for Carbon-14 determination, two for soil samples to be processed by John E. Fitch, and one to remove human bone exposed in the bank. Approximately 24 m^3 of earth was dug in 858 man-hours of effort.

Excavation was done by trowel in 10 cm levels, and all earth was screened. Nine pits were double-screened using both ¼ and ⅛ inch mesh; the others, peripheral and less productive, were screened to ¼ inch. Because there was no source of running water available and the midden was extremely damp, making all screening difficult, all material remaining in the screens was sacked, labeled, and removed to Mr. Browne's laboratory in Oak View. There sluice tables were constructed, all materials washed and air-dried, and all components sorted. The artifacts recovered include 658 catalogued objects, 31 ceramic fragments, 3,679 shell beads, and 1,322 historic items (Table 1).

The respective amounts of shell, bone, stone, charcoal, asphaltum, and burned clay were weighed and tabulated for each screen size, for each pit. Four pits were designated to provide additional information on distribution of shell species, one on the eastern periphery, one at the west end, and two in the center. In these, all shell was identified.

Shell and charcoal samples were prepared in the hopes that a Carbon-14 determination of age may be obtained. Samples were taken from a central isolated column in pit S 5-E 9, from the center of each of the 10 cm levels between 10 and 80 cm in depth. Three samples were prepared from each level: charcoal, *Protothaca staminea,* and *Tivela stultorum*. The *Protothaca* was chosen because it is the overwhelmingly dominant shell in the midden, and *Tivela* for ease of comparison with other Carbon-14 dates. A further research objective is to see if the dates obtained from the three different kinds of sample would agree and corroborate each other.

The uppermost 5-10 cm of the site proved to be overburden of brown soil (10 YR 5/3-3/4 on the Munsell scale) composed mostly of rooty recent fill dumped by the city and heavily compacted by use of the area as a parking facility. Below this, very dark brown to black, shell-bearing midden was encountered with color of 10 YR 2/2 and 3/2 (Munsell) and a mean pH of 8.0 (Heilige scale). At an average depth of 50-60 cm, the midden rested on an irregular base of yellow clays (2.5 Y 6/4 to 4/4 Munsell), which extended four feet to the beach sands. Gopher runs were traced below 80 cm, accounting for some admixture of shell, bone, and cultural material below the presumed level of occupation.

Burial

The sole burial was discovered after the formal excavation was completed, in the course of a routine inspection of the site. Recent storms and high tides had exposed human bone protruding from the bank in an area east of the earlier excavations, whereupon a pit was staked out and a primary inhumation removed.

The individual lay in a loose flexed position on the right side, oriented head to the north. The

TABLE 2
Measurements of Burial

Bone	*Left*	*Right*	*Remarks (all dimensions in cm)*
Femur	37.7	Frag.	Bicondylar length of l. femur 37.2.
Tibia	31.0	Frag.	
Fibula	29.5	Frag.	
Humerus	27.0	Frag.	
Radius	20.5	20.5	
Ulna	Frag.	—	
Clavicle	—	12.1	
Pelvis	—	Frag.	Female, sacric notch 80°, pubic symphasis absent.
Sacrum			Fragment, wide, female.
Scapula			Fragment.
Skull			Fragment 17.3 by 14.3; cephalic index 82.5.
Mastoid process			Small, female.
Supraorbital ridge			Small, female.
Mandible			Wide, female
Dentition			Complete, well worn except for third molars, young adult about 21 years.

right arm was extended behind the back. The top of the skull had been crushed. Proximal end of right femur and distal ends of right tibia and fibula were missing; these had been projecting out of the bank and apparently were washed away by tidal action. The teeth all show considerable wear, except for the third molars which were newly erupted. The differential wear between these and the first molars was so extreme that there could be no bite contact on the latter. The bones were those of a young adult female.

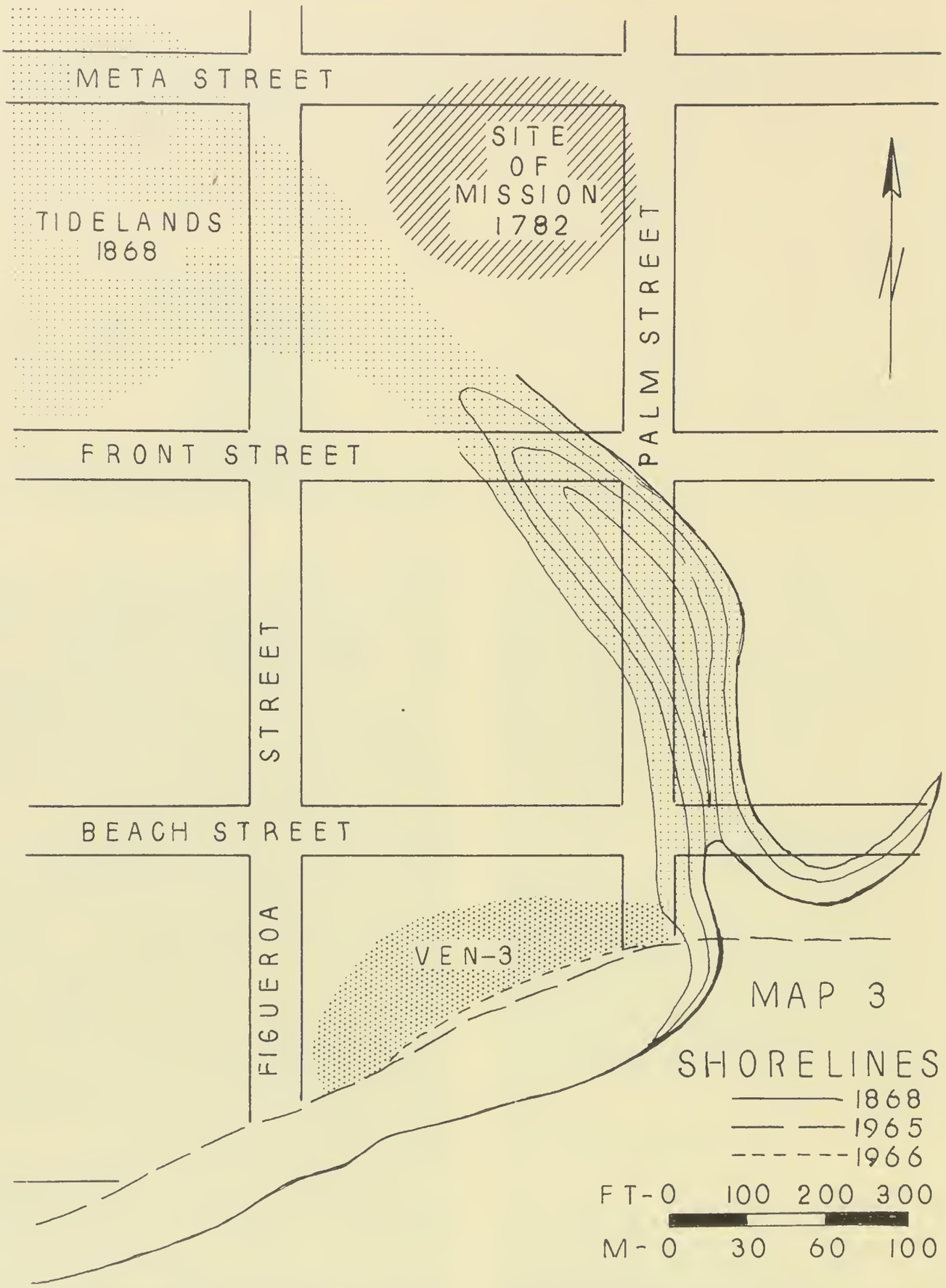
The burial rested directly on the base clay at 40 cm, surrounded by midden. The uppermost 10 cm of the earth in the pit was composed of recent trash fill. Screening of the surrounding earth below this overburden produced 25 shell beads, two chert drills, and 79 otoliths, although none of these was in direct association with the burial. There was no evidence of an excavated grave, lining, marker, or offerings.

Features

Two features were studied, both related to fires and both in the same pit, although separated vertically by a distance of 50 cm. The uppermost, Feature 1, is an area of fire-reddened earth covering the northeast quadrant of E 11-S 3. The stained area is irregular and non-patterned, 45 cm across at the widest point. It became visible at a depth of 30 cm and extended to 40 cm; the sands below were somewhat discolored down to 50 cm. Within the margins of the pit in the 30-40 cm level were 43 rocks mostly between 10-15 cm in diameter; 36 of these were burned. The stones showed no deliberate arrangement but may have been part of a hearth which was subsequently dislodged. The soil had a pH value of 7.5 (Heilige), as compared to an average for the midden of 8.0, and on contact with muriatic acid, fizzed for seven seconds, as compared to 2-3 seconds elsewhere on the site.

Feature 2 was a concentration of large rock, also interpreted as a hearth, which occupied the central one-third of the southern half of E 11-S 3 and extended into the northern portion of E 11-S 4. The top of the cluster was encountered at 80 cm, and the base of the largest rock extended to 98 cm. The feature was composed of 16 large stones (more than 20 cm in greatest diameter) and 9 smaller stones, all burned. They were closely packed in a dense, roughly circular arrangement about 80 cm in diameter. The immediate area was dark midden containing shell, bone, and charcoal, at a depth otherwise characterized by yellow clay. A black lens of ash, charcoal, and asphaltum underlay the stones. The area below the feature was excavated down to 105 cm, but proved sterile.

Within the stones of Feature 2 were the following artifacts: two cobble bar tools, one heavily stained with asphaltum, one tarring pebble, and one quartzite chopper. Amidst the rocks were three shells of *Tivela stultorum*, three *Protothaca staminea*, two *Mytilus californianus*, and one *Tegula funebralis*, seven fish bones, and two small mammal bones (rodent ?). One large mammal rib (artiodactyl ?) was adjacent to the feature at 80 cm. There were abundant lumps of charcoal about 1 cm in diameter, and one large flat cake of asphaltum 6.0 by 6.0 by 2.0 cm, plus smaller pieces of the same, with wood embedded in it.



No other artifacts were in direct association with either of these features, but the two pits which contained them were among the most productive of all in artifact yield.

The profile of an additional fire pit, not designated as a feature since it could not be studied, was observed in the bank in line with the E 10 pits. In contrast to Feature 1, this was clearly a symmetrically circular area of burned red earth with a round-bottomed, excavated basin. The depth from the surface was 70 cm below datum, the diameter was 40 cm, and the basin would have been 20 cm deep. There was no rock in the immediate vicinity. The swordfish bill artifact was recovered from the bank slightly to the east of this hearth.

Figure 2. Projectile Points and Blades. a. Top 4 rows — Projectile points, Class 1. b. 5th row, first 5 ex. on left — Projectile points, Class 2. c. 6th row, first 2 ex. on left — Projectile points, Class 3. d. 6th row, 3rd ex. — Projectile point, Class 4. e. 6th row, 2 ex. on right — Blades, Class 4. f. 7th row, first ex. on left — Blade, Class 2. g. 7th row, 2nd ex. from left — Blade, Class 3. h. 7th row, 3 ex. on right — Blades, Class 1.

To the west of the above hearth, a possible house floor was observed during a preliminary visit to the site in January, 1965. The profile of a densely compacted earthen layer with stone and ash resting directly in contact above it could be seen in the bank. By the time the excavations were approved in July, the bluff had lost more than five feet to erosion and vandalism, and this area had disappeared.

STONE ARTIFACTS

FLAKED STONE

A fairly representative assemblage of flaked stone tools was recovered, including projectile points, blades, drills, scrapers, and other forms. With all due reservations about such a subjective generalization, it may still be said that within each group, the design was unstereotyped and the workmanship casual. Cortex was commonly present on the tools, with only enough flaking performed to shape or trim the working edge; such chipping was most often performed by percussion. The preferred lithic material for the smaller artifacts was chert, and for the larger tools subject to heavy usage, quartzite. What appears to be a cumbersome array of categories within each classification is evidence of the lack of standardization of ideal types.

Projectile Points

A total of 93 projectile points was examined, 53 as a product of the excavation and 40 in private collections. Of the total, 56 were either complete or nearly enough so to yield information about style and dimensions. They are distinguished from the group of artifacts called blades by being substantially smaller and lighter, and differentiated among themselves by general over-all configuration and design of base.

1. Narrow triangular, with concave base — 37 examples (fused shale — 19; chert — 14; chalcedony — 2; shale — 2). This is by far the most common shape at this site. Three points are serrated, and two are stained with asphaltum. All bases are thinned, but there is great variation in the amount and quality of edge retouching.

Length:	1.2-3.0 cm	Average: 2.1 cm
Width:	0.7-1.3 cm	Average: 1.1 cm
Thick.:	0.3-0.5 cm	Average: 0.36 cm
Weight:	0.3-1.6 g	Average: 0.68 g

2. Triangular, with straight base — 5 examples (fused shale — 2; chert — 2; shale — 1). This group is more casually made than the above, with poor symmetry and a minimum of flaking.

Length:	1.5-2.3 cm	Average: 1.9 cm
Width:	1.0-1.6 cm	Average: 1.2 cm
Thick.:	0.3-0.4 cm	Average: 0.36 cm
Weight:	0.5-1.2 g	Average: 0.82 g

3. Lanceolate — 8 examples (chert — 6; chalcedony — 1; sedimentary rock — 1). This group varies in size but is alike in willow-leaf outline, with the greatest width below the mid-point. All bases are thinned, and either tapered or rounded. One chert specimen retains cortex on one surface. Two others are serrated along one edge only. The chalcedony example is notably delicate and well made.

Length:	2.2-3.6 cm	Average: 2.8 cm
Width:	0.8-1.5 cm	Average: 1.2 cm
Thick.:	0.3-0.7 cm	Average: 0.5 cm
Weight:	0.9-3.0 g	Average: 1.47 g

4. Triangular, with short stem — 2 examples (fused shale — 1; chert — 1). These were the only complete stemmed points found, and both are coarse and asymmetrical. The smaller, shale example has a straight stem with straight base. The chert specimen lacks some of its length; the stem is contracting with convex base.

Length:	2.1 and (est.) 3.5 cm
Width:	1.1 and 1.5 cm
Thick.:	0.4 and 0.6 cm
Weight:	0.8 and (est.) 2.0 g

5. Lanceolate, shouldered, stems or bases broken — 2 examples (fused shale — 1; chert — 1). Both of these points are broken off below the shoulder, at the place where a stem or sharply contracting base may be assumed to begin. Estimated from the contour, each was probably at least 0.5 cm longer than the measurements cited below.

Length:	2.5 and 3.2 cm (as is)
Width:	1.3 and 1.3 cm
Thick.:	0.4 and 0.5 cm
Weight:	1.3 and 1.7 g (as is)

6. Incomplete or reject — 1 example (fused shale. Bifacial flaking has been completed on the tip and along both edges one-third of the distance towards the base. The edges have been further flaked from one side only almost to the base, but the base has not been worked or thinned. Present length is 2.3 cm, width 1.1 cm, thickness 0.8 cm, and weight 1.8 g.

7. Fragments — 38 examples.

a. Tips — 18 examples (chert — 11; fused shale — 5; quartz — 1; chalcedony — 1). The fragment of white quartz is thick and crude, with matrix remaining on one face. One fused shale example is serrated.

b. Median fragments — 9 examples (chert — 6; fused shale — 2; green jadeite — 1). Two specimens show evidence of asphaltum stain; one of these, the jadeite fragment, has been reworked and used along one broken margin. One example is serrated.

c. Bases — 11 examples (chert — 7; fused shale — 4). Three of the group are concave, three are convex, two are tapering, and two are straight across. The eleventh specimen is unfinished but appears intended for a convex base.

Unlike the distributions at Arroyo Sequit (Curtis, 1963), Burton Mound (Harrington, 1928), and Soule Park (Susia, 1962), where leaf-shaped points strongly predominated, the collection at Ven-3 was composed 68 per cent of the narrow triangular, concave base points. At Goleta (McKusick, *et al.*, 1961) and Rancho Canada Larga (Greenwood and Browne, 1963), these two groups were approximately equal. The concave based point is usually considered late in time.

The category which is described as triangular with straight base was apparently not found at Goleta, was rare at Arroyo Sequit (Curtis, 1963), appears in one illustration at Burton Mound (Harrington, 1928: Pl. 17g), and one example at Gilmore Ranch (Wallace, 1955). The Gilmore Ranch site is assumed to be early, pre-Hispanic. At Ven-3, only three out of the group of five were recovered from the excavation, but these were unusually deep — two in the 50-60 cm level and one in the 80-90 cm level, the latter being the deepest of any point found. All exhibit only perfunctory flaking. Considering the depth and workmanship, although mindful of the small sample, one may ponder whether these are ancestral to the triangular, concave base points.

Blades or Dart Points

These tools are considered separately from the projectile points, which they otherwise resemble, because of their substantially greater size and weight. A total of 24 was examined, 11 from the excavation units and 13 loaned by private collectors. They are symmetrical, bifacially flaked tools, and have been grouped according to configuration.

1. Broad triangular, concave base — 3 examples (all chert), two whole and one basal fragment. One of the unbroken specimens is an almost perfect equilateral triangle. Two are stained with asphaltum at the base. All are well made with fine bifacial edge retouch.

Length:	3.0 and 3.5 cm	
Width:	2.5-2.9 cm	Average: 2.8 cm (3 ex.)
Thick.:	0.4-0.7 cm	Average: 0.6 cm (3 ex.)
Weight:	4.2 and 4.7 g	

2. Long triangular, concave base — 1 example (chert). This artifact is symmetrical and bifacially retouched along all edges, but retains matrix on both surfaces. The tip is rounded rather than tapered to a point. Some traces of asphaltum may be seen at the base.

Length:	5.7 cm
Width:	(est.) 3.8 cm
Thick.:	0.4 cm
Weight:	6.7 g (as is). Est. 8.9 g if unbroken.

3. Triangular, straight to slightly convex base — 5 examples (chert — 4; chalcedony — 1). These examples are less well made than any of those above. Two retain matrix on both surfaces, and two are unworked on one face. One retains the bulb of percussion at the apical end. The three unbroken specimens are asymmetrical and bear only coarse percussion flaking along the edges. The bases are thinned, except for the chalcedony tool which may be unfinished. One example is fragmentary; it is a thinned convex base which is stained with asphaltum along the fracture, as if the original base had been used, after the tool was broken, as the working end of a hafted implement.

Length:	3.0-4.1 cm	Average: 3.6 cm
Width:	2.0-2.6 cm	Average: 2.3 cm
Thick.:	0.4-0.7 cm	Average: 0.6 cm
Weight:	4.6-7.4 g	Average: 5.9 g

4. Lanceolate — 6 examples (chert — 4; chalcedony — 2). This group is all surface material. Four are broken; of these, two are weakly shouldered and may or may not have been stemmed. The sides of all examples are slightly convex. All exhibit a minimum of workmanship; one retains matrix on one face, and another exhibits the bulb of percussion. A third specimen, made on an arched interior flake, shows no chipping at all on the concave face. They are all asymmetrical to some degree. One specimen which has the tip broken and two spalls off one edge, has been retouched along all broken surfaces.

Length:	3.3-8.0 cm	Average: 5.3 cm
Width:	1.6-4.2 cm	Average: 2.6 cm
Thick.:	0.6-0.9 cm	Average: 0.7 cm
Weight:	3.6-33.2 g	Average: 12.9 g

5. Side-notched — 1 example (chert). This broken surface specimen is the only side-notched point or blade. It is probably unfinished; the base is thinned but the edges are not retouched and one side is still thick. However, the sides are notched above an expanding, convex base.

Length:	5.0 cm (est.)
Width:	2.2 cm
Thick.:	1.2 cm
Weight:	7.5 g (est.)

6. Fragments — 8 examples (chert — 7; fused shale — 1). One chert specimen is a sharply pointed tip of which not enough is present to reconstruct the shape of the complete tool. The fused shale fragment is a tapering, convex base, possibly from a stemmed implement different from any of the above. The other six chert fragments have thicknesses at the break of 0.8-1.3 cm, and were probably large, heavy artifacts. One is the base of a blade which may have been leaf shaped and weakly shouldered.

It was noted in the section discussing projectile points that a triangular form with straight base was found distinctly lower in the midden than other shapes. Among these larger blades, a triangular category similarly seems to occur lower than the distributional curves for either this artifact class alone, or for the total of all artifacts plotted together. The blade sample is too small for statistical proof of significance, but this design might be watched carefully in future research.

The presence of asphaltum on four blades suggests that these tools may have been used as hafted implements.

Choppers

The nine choppers are generally wedge shaped, tapering from a broad butt which was presumably grasped in the palm of the hand to a thinned chopping edge which is blunted from use. All retain cortex; all but one have cortex on the butt. The under surface of seven examples is a fracture plane, one is flaked on the bottom, and the ninth has cortex on top and bottom. The working edge of eight examples is formed by coarse unifacial percussion flaking; on only one specimen are a few additional flakes detached from both faces. The group has been divided according to the contour of the working edge.

1. Straight to convex working edge — 6 examples (quartzite — 4; siltstone — 2). Three of these choppers have working edges which are basically straight. The edge of the fourth and fifth is convex, and the sixth (siltstone) is used on both of the two opposed long edges, one convex and one straight. The smallest quartzite specimen has one straight chopping edge which has been heavily used, and another sharp edge which may have served as a scraping plane.

Length:	6.0-10.5 cm	Average: 8.4 cm
Width:	4.6-9.8 cm	Average: 6.5 cm
Thick.:	3.2-5.6 cm	Average: 4.1 cm

2. Double-concave working edge — 3 examples (quartizite — 2; siltstone — 1). The working edge of this group has been formed by the removal of broad flakes on both sides of a central point, leaving a distinct keel. The greatest wear is naturally in the area of the central protuberance, but it is not the kind of tip-blunting or crushing found on implements employed as pecking tools. Except for the unique configuration and the pattern of wear, these might have been considered as scraping planes.

Length:	7.6-8.5 cm	Average: 7.9 cm
Width:	6.0-6.9 cm	Average: 6.5 cm
Thick.:	3.6-4.8 cm	Average: 4.2 cm

Hammerstones

The hammerstones numbered 31, 21 from the excavations and 10 from surface collections. Most typically, they are large and heavy, predominantly quartzite cobbles, used either whole or split in half. All show substantial battering.

1. Cobble hammerstones — 26 examples.

a. Whole cobbles — 12 examples (quartzite — 7; porphyry — 2; gabbro — 1; granite — 1; basalt — 1). These are tools which show use but no modification. They are battered at one or both ends, and in some cases, spalled from use. Several weigh in excess of one kilogram.

Length:	7.0-12.0 cm	Average: 9.9 cm
Width:	6.7-10.0 cm	Average: 8.3 cm
Thick.:	3.9-7.8 cm	Average: 6.0 cm

b. Half cobbles — 14 examples (quartzite — 11; andesite — 3). This group is composed of cobbles which have been split, usually along the shorter axis. In some cases, one or two broad flakes have been detached to improve the striking edge, but in all cases, approximately half of the tool is covered with cortex. One of the implements is almost certainly an exhausted chopper; others, too, may have been first used for cutting, chopping, or scraping until they became too blunted. These tend to be slightly smaller than the class above.

Length:	6.1-12.4 cm	Average: 8.6 cm
Width:	5.8-9.0 cm	Average: 7.3 cm
Thick.:	4.2-8.2 cm	Average: 6.1 cm

Figure 3. Choppers and Hammerstones. a. 1st row — Hammerstones, Class 1a. b. 2nd row — Hammerstones, Class 1b. c. 3rd row — Hammerstones, Class 2. d. 4th row — Choppers, Class 1. e. 5th row — Choppers, Class 2.

2. Core hammerstones — 3 examples (all quartzite). These tools have been flaked over an average of ⅔ of their surface, and the intersections of the cleavage planes are severely bruised from battering. The final use of these stones for hammering is probably secondary, or even tertiary to the original utilization. Two of the specimens may have been used as choppers after the primary flakes were detached. They are the smallest of the hammerstones.

Length:	6.3-8.2 cm	Average: 7.2 cm
Width:	6.1-7.6 cm	Average: 6.9 cm
Thick.:	4.7-7.3 cm	Average: 5.9 cm

3. Interior flake hammerstones — 2 examples (both quartzite). These aberrant specimens are interior flakes, retaining cortex only on one narrow arc which presumably rested in the palm of the hand. They are both D-shaped in profile, much like the flake knives, and may well have originally served as such. As found, however, the forward or pointed edges are severely battered, and one intersection between cortex and a fracture plane is also battered.

Length:	8.5 and 8.8 cm
Width:	6.8 and 8.0 cm
Thick.:	3.5 and 3.9 cm

Flake Knives

The 25 flake knives are for the most part casually made tools with a minimum of modification, yet they conform to a general pattern of size and workmanship more closely than most of the other categories of flaked implements. They tend to be subrectangular in outline with a wedge cross section tapering from a broad butt held in the palm to a narrow cutting edge. They are most often made on interior flakes with the bulb of percussion remaining on the nether surface. The "top" or narrow end adjacent to the cutting edge is flat, as if to steady the index finger; this surface may be either the original cortex or, less often, a fracture plane. Major flake scars on the upper surface usually run parallel to the cutting edge. The group is divided according to the number, location, and modification of the cutting edge.

1. One long cutting edge, unifacial — 13 examples (quartzite — 7; siltstone — 3; sandstone — 2; andesite — 1). This group has been used and modified, if at all, along one long edge only. Eight are interior flakes, seven with bulb, and four are primary flakes, one with bulb. Seven have had some unifacial edge retouch. On eight, the index finger rest is cortex, the others being a fracture plane. On five, there is cortex on the upper aspect; four have cortex remaining on the butt, or palm grip; and one has cortex on the under surface. On ten of the tools, the cutting edge is on the left, as if used by a right-handed individual, whereas three tools are the reverse.

Length:	6.1-7.8 cm	Average: 6.9 cm
Width:	3.2-6.5 cm	Average: 5.3 cm
Thick.:	1.4-3.1 cm	Average: 1.9 cm

2. One short cutting edge, unifacial — 3 examples (quartzite — 2; sandstone — 1). These knives differ from the above because one short edge has been used for cutting, with the adjacent longer side used as a finger rest. Two are primary flakes with unifacial edge retouch, and the other is an interior flake with bulb of percussion present. Two have cortex both on the finger rest and butt end, while the other has cortex on the upper surface and a fracture plane as a finger rest. All have the used edge on the left.

Length:	5.0-7.0 cm	Average: 6.2 cm
Width:	4.0-6.1 cm	Average: 5.2 cm
Thick.:	1.1-1.6 cm	Average: 1.4 cm

3. Two long cutting edges, unifacial — 5 examples (all quartzite). These knives, otherwise similar to group 1. above, have been used on the two opposed long edges. The finger rest is a fracture plane on three specimens, and cortex on two. Four are interior flakes with the bulb remaining. Three have unifacial edge retouch, and three have cortex on one surface. On one tool which is triangular, the point where the two cutting edges intersect has had some use. Another specimen has a convex edge between the two cutting edges which has been used.

Length:	6.6-8.5 cm	Average: 7.4 cm
Width:	4.5-5.4 cm	Average: 4.9 cm
Thick.:	1.8-3.0 cm	Average: 2.2 cm

4. Bifacial, sinuous edge — 4 examples (all quartzite). This group is distinct because they have edges which are bifacially modified by the alternate detachment of flakes from either side to produce a sinuous cutting edge. Two have two opposed long cutting edges, as in 3. above; the others have one long edge, each on the left side. Three are interior flakes with the bulb present; the other is a primary flake. Three have cortex for a finger rest. The sinuous edges are produced by the removal of broad percusssion flakes up to 3.0 cm wide.

Length:	5.8-8.7 cm	Average: 7.2 cm
Width:	4.4-6.0 cm	Average: 5.5 cm
Thick.:	1.5-3.2 cm	Average: 2.6 cm

Figure 4. Drills. a. 1st row — Class 1a. b. 2nd row — Class 1b. c. 3rd row — Class 1c. d. 4th row — Class 2.

Scraper Planes

Eight large scraper planes were recovered, six of quartzite and two of a very fine grained shale. They are unifacially flaked with the angle of the working surface between 45-90°, mostly toward the higher figure. They are distinguished from choppers in having a lower surface which is notably flat and the extent to which they are modified around the periphery. Six are flaked all — or almost all — around the stone; two are broken cobbles with cortex on top, bottom, and unworked sides, with a dressed edge at least half of the circumferance. They are considered scraper planes because the greatest wear is on the nether surface. All but one are more or less tabular, with an upper surface roughly parallel to the planing surface. The exception, also the smallest of the group, is higher than it is wide.

Three have cortex on both top and bottom. Three have cortex on top and a fracture plane on the bottom, and the other two have cortex on the bottom and fracture scars on top.

Length:	5.0-10.2 cm	Average: 7.2 cm
Width:	2.0-9.7 cm	Average: 5.1 cm
Thick.:	1.7-5.5 cm	Average: 3.4 cm

Drills

Considered together is a group of 80 tools whose primary function appears to be piercing or drilling. In most cases, they are flaked all over, but the greatest care and amount of chipping is found at the tip. The working end is always thinner and narrower than the butt except in the few specimens which are bipointed. Except in the category of elongated, slender drills (2. below), these tools are much thicker in relation to their width than are projectile points or blades, and much less symmetrical. They are divided on the basis of shape into one group of stubby drills, with sub-groups according to size, and a second classification called elongated, slender drills. Chert is preferred raw material.

1. Stubby drills — 71 examples. These artifacts are thick and broad. In many cases, the butt ends are tapered and would be suitable for use if and when the primary tip became too blunted. However, none is called bipointed unless both ends show evidence of wear.

a. Small — 41 examples (chert — 36; chalcedony — 2; shale — 1; quartzite — 1; porphyry — 1). This size is the most chunky, the width being nearly half of the length. Six are bipointed. In cross section, 22 are roughly four-sided; 14 are triangular; two are five-sided; and the others are nodular.

Length:	1.4-2.6 cm	Average: 2.2 cm
Width:	0.6-1.5 cm	Average: 1.0 cm
Thick.:	0.5-1.3 cm	Average: 0.8 cm

b. Medium — 25 examples (chert — 19; chalcedony — 3; fused shale — 1; sandstone — 1; quartzite — 1). This group is longer than the above, and slightly slimmer, the width averaging 40 per cent of the length. Four are bipointed. In cross section, 17 are four-sided and seven are triangular. The sandstone specimen is notably well shouldered all around as if it had been used for drilling stone.

Length:	2.7-3.7 cm	Average: 3.0 cm
Width:	0.7-2.0 cm	Average: 1.2 cm
Thick.:	0.6-1.6 cm	Average: 1.0 cm

c. Large — 5 examples (all chert). These are the slimmest of the stubby drills, with width 30 per cent of the length. In contrast to the two smaller groups, these are more apt to be triangular in cross section. Four are three-sided; only one is four-sided. One is bipointed.

Length:	4.0-4.6 cm	Average: 4.3 cm
Width:	1.1-1.6 cm	Average: 1.2 cm
Thick.:	0.9-1.6 cm	Average: 1.2 cm

2. Elongated, slender drills — 9 examples (all chert). Unfortunately, only one of these tools is unbroken. As the name implies, the group is very long and slim, and they were undoubtedly very delicate and fragile implements. Six are triangular in cross section, two are four-sided, and the intact specimen is keeled on both sides with a lenticular profile. The unbroken tool might have been classified as an extremely long and narrow projectile point except that it is very nearly as thick as it is wide, and is not thinned at either end. This tool is bipointed; the others are broken.

Length:	4.8 cm (1 ex.)	
Width:	0.5-1.0 cm	Average: 0.8 cm (9 ex.)
Thick.:	0.3-1.0 cm	Average: 0.7 cm (9 ex.)

Pick or Reamer

The one tool of this category was found on the surface. It is a thick, chunky artifact of chert, flaked all over. It has been brought to a roughly triangular cross section at the working tip which is thick, broad, and undercut. It shows constriction and crushing for a distance of 0.5 cm back from the point, and it looks as though the point has been resharpened. The tool measures 3.0 cm in length, 2.2 cm in width, and 1.7 cm in thickness.

Gravers

The five small tools presumably used for graving or incising all have a fine, very short, slightly undercut point formed by the removal of tiny flakes on both sides of the projection. All are made of chert and are keeled at the tip. Two are modified from one face only; the others are bifacially flaked. Three have been flaked along one or both sides as if for additional use as scrapers.

Length:	2.1-3.5 cm	Average: 2.6 cm
Width:	1.1-1.9 cm	Average: 1.4 cm
Thick.:	0.4-1.1 cm	Average: 0.8 cm

Ovoid Scrapers

The adjective ovoid is used to describe a group of six scrapers which are more or less round to oval in shape, but should not be understood to imply a degree of symmetry or fine workmanship which does not exist. They are all irregular. Four are dome-shaped on the upper surface, one because it is a primary or Teshoa flake, and the other three as a result of flaking. The remaining two — the smallest in the group — are elongated and keeled in the longer dimension. All but one are modified and used all around the periphery. The other, the largest tool and an interior quartzite flake, is used on ¾ of the margin, with cortex undisturbed on the remainder. Four retain some cortex. Four of the group are chert, and two are quartzite.

Two of the tools have unifacial modification only. Three have a little bifacial flaking, but this does not mean they are neatly retouched all around, only trimmed here and there where necessary to remove cortex or reduce a broad percussion scar.

Length:	3.1-6.9 cm	Average: 4.7 cm
Width:	1.8-6.5 cm	Average: 3.8 cm
Thick.:	0.8-2.2 cm	Average: 1.5 cm

Side Scrapers

The group of 20 side scrapers is characterized by a modified, used edge along one (17 ex.) or two (3 ex.) long sides of the implement. Eight of the tools have straight working edges, ten have convex edges, one has a concave edge, and one double-edged scraper has one straight and one convex edge. The lithic materials are chert — 17, chalcedony — 2, and quartzite — 1. Seven of the group are modified bifacially, and 13 on one face only; there is no correlation between this factor and the number or configuration of worked edges. The specimen with the concave edge may have been used secondarily as a graver on the opposed tip.

Eleven side scrapers were made on interior flakes, two of them arched. Five are primary flakes. One of the arched interior flake examples may be a rejected projectile point; it is lanceolate in outline and the most symmetrical tool in the group. The others are highly irregular flakes or nodules with a minimum of modification. Seven retain some cortex.

Length:	1.7-5.3 cm	Average: 3.5 cm
Width:	1.2-4.4 cm	Average: 2.3 cm
Thick.:	0.3-2.7 cm	Average: 1.1 cm

End Scrapers

The 14 end scrapers show use and a little flaking, either preparatory or from use, at the narrow end of the basic material. The working edge is straight in six examples, convex in five, and concave in two. The other tool has worked edges at both ends, one straight and the other convex. The edge varies in useable area from 0.8 to 4.1 cm, with an average of 1.9 cm. Only three of the group are bifacially worked, the others being flaked from one face only. The lithic materials are quartzite — 5, chert — 4, fused shale — 1, sandstone — 1, chalcedony — 1, fused shale — 1, and porphyry — 1.

Of the total, 12 are made on interior flakes, eight retaining the bulb of percussion. One of the interior flakes is a triangular tool with the blunted narrow end serving as the working edge and a heavy incrustation of asphaltum possibly forming a handle at the butt. One of the implements made on a small primary flake may be a reject of a concave base projectile point; the concave basal end has been used as the scraping edge. One of the quartzite tools seems to be an exhausted core; the used edge is on one of the intersecting fracture planes perpendicular to the cortex striking platform.

Length:	2.0-6.4 cm	Average: 4.0 cm
Width:	1.0-5.0 cm	Average: 2.6 cm
Thick.:	0.5-1.7 cm	Average: 1.0 cm

End and Side Scrapers

All that this group of 16 scrapers has in common is that they have had modification and use on one narrow end and one or both long sides. Eight are used on both long sides; eight on one side. Six have bifacial edge retouch, while the others have unifacial flaking only. While the scraping edge is generally straight to slightly convex, six of the tools have one used area which is distinctly concave; of these, the concavity is on one long side in four cases, and at the end in two examples. One of these particular specimens looks like the reject of a narrow triangular, concave base projectile point.

Figure 5. Scrapers. a. 1st row — End scrapers. b. 2nd row — Side scrapers. c. 3rd row — End and side scrapers. d. 4th row — Ovoid scrapers.

Eight of the group are interior flakes, and nine retain some matrix. Eleven are made from chert, three are chalcedony, and two are fused shale.

Length:	2.5-6.5 cm	Average: 4.1 cm
Width:	1.8-4.5 cm	Average: 2.7 cm
Thick.:	0.7-2.4 cm	Average: 1.1 cm

Small Scraper Planes

The six small scraper planes resemble the large planes in being usable all around the periphery, but their diminutive size sets them apart in a separate category. Certainly, they would have served a different purpose. The miniatures are all keeled away from one pointed end, as if they were held between the thumb and forefinger and pushed away from the user. The bottoms of all specimens are fracture planes. The edges are formed by the intersections of additional cleavages. On four of the examples, the two sides adjacent to the pointed end are retouched; on the others, three edges are retouched — all unifacially. The small planes tend to be thicker in relation to surface dimension than the other small scraping tools. Four are chert, one is chalcedony, and the sixth is fused shale.

Length:	1.2-2.7 cm	Average: 2.0 cm
Width:	0.9-1.7 cm	Average: 1.3 cm
Thick.:	0.8-1.4 cm	Average: 1.2 cm

Clam Pick

This artifact might have been considered a fragment or a reject of a blade — which, of course, it may well be — except for the coincidence of finding it within a valve of *Protothaca staminea*. Its size, shape, and curvature fit within the shell so perfectly that it is described separately with the thought that this implement, and possibly other blades like it, may have been fashioned to scoop the edible portions out of clam shells. Similar shapes occurred at Arroyo Sequit, and the author commented that they differed from the other projectile points with which they are classified (Curtis, 1959; 1963).

The artifact is a broad triangle with straight base, almost equilateral. Two sides are bifacially retouched with well-controlled flaking; the third is worked from one side only. The piece is highly arched. One face is spalled; whether this happened accidentally and caused it to be rejected as a point or blade or whether, by deliberately making the artifact concavo-convex, it became more suitable for extracting clams, remains a matter for conjecture. If it were indeed to have been a point or blade without the disfiguring spall, it would have been unusually thick, and thickest at the base.

The implement is made of chert and measures 3.1 cm in length, 2.6 cm in width, and 0.7 cm in thickness. It weighs 4.7 g.

Used Cores

Four cores have been used as scraping tools after they became too thinned to serve further as a source of flakes. Two are quartzite, one is chert, and the fourth is siltstone. All have a flat striking platform with a base which is roughly parallel, and flakes have been detached all around the periphery. One shows scars from use on two edges, two on three edges, and the fourth shows wear on five edges. Two have been unifacially retouched along one edge of the striking platform.

Length:	3.7-5.1 cm	Average: 4.3 cm
Width:	3.1-3.6 cm	Average: 3.3 cm
Thick.:	1.5-2.2 cm	Average: 1.8 cm

Miscellaneous Used Flakes

In addition to the scrapers which have been categorized above, there were 10 amorphous flakes which had seen use. These do not show retouch or deliberate modification, but do evince wear along one or more edges as if a handy piece of material was picked up and used as needed.

Of the seven larger pieces, four are chert, and there is one each of quartzite, quartz, and chalcedony. All but one are interior flakes, four with bulb of percussion. They have been variously used — all around the periphery, on one side, at one end, on two long sides, on two short sides, and on one end and two sides. The smallest of the group measures 2.4 by 1.5 by 1.0 cm; the largest is 5.7 by 3.8 by 1.2 cm.

The three smaller random scrapers are prismatic or lamellar flakes, slightly arched and triangular in cross section. Two are chalcedony, and the other is fused shale. One chalcedonic specimen is used at one end and on two long sides; the others show wear on one end and one side. They are fairly uniform in size, averaging 2.3 cm in length, 0.9 cm in width, and 0.6 cm in thickness.

GROUND, POLISHED, AND PECKED STONE

The assemblage of ground, polished, and pecked stone is distinctly meagre compared to the totals for either flaked stone or shell artifacts, and even smaller than the collection of more perishable bone tools. There are a few examples each of bowls, pestles, and other items involved in the preparation of plant foods; beads; and a few miscellaneous objects.

Figure 6. Bowls and Small Mortars. a. 1st row, left — Bowl c. b. 1st row, center — Bowl a. c. 1st row, right — Bowl b. d. 2nd row, left — Small mortar c. e. 2nd row, center — Small mortar a. f. 2nd row, right — Small mortar b.

Bowls

Fragments representing seven different sandstone bowls were examined, five from surface collections and two from the field work. Four were rims; the other three were sections of the vessel wall or base. Since the group is both small and varied, each will be described individually.

a. Rim fragment measuring 6.5 cm along the rim and 4.2 cm of the wall. The rim is rounded, lower on the exterior, and 1.6 cm thick. Thickness of the body wall at the break is 2.4 cm. Both inside and outside are ground, the interior being smoother. This would have been a small bowl, with a diameter estimated at about 17 cm. It was found in the 20-30 cm level.

b. Rim fragment measuring 2.8 cm along the rim and 8.2 cm down the wall. The rim is rounded and thinned, highly convex, tapered to a thickness of 1.2 cm. Thickness of the body wall at the break is 4.8 cm. The exterior is pecked; the inside is ground very smooth. This was likely a large vessel with a diameter of approximately 30 cm. Surface specimen.

c. Rim fragment, 14.9 cm of rim and 11.2 cm of wall. The rim is straight across and 2.3 cm wide. It intersects with the exterior body wall at a sharp right angle, but a beveled band of grinding makes the transition to the interior more gradual. Both outside and inside are pecked and well shaped; the interior is smoother. Thickness at the break is 4.5 cm. This would be a large and fine specimen if whole, with an extrapolated diameter of about 33 cm. Surface specimen.

d. Rim fragment, approximately one-third of a large bowl with an estimated diameter of 28 cm. The rim is straight across, 3.3 cm wide. The sides are well finished and smooth inside and out; maximum wall thickness at the break is 4.7 cm. A large clot of asphaltum adheres to the interior. Surface specimen.

e. Body wall fragment, 12.5 by 8.2 cm. This example shows only the pecked exterior of what must have been a large, heavy, thick bowl or mortar of coarse-grained sandstone. The piece is 6.7 cm thick as is, but since there is no interior surface present, the unbroken vessel would have been even thicker. Surface specimen.

f. Body wall fragment, 11.0 by 6.9 cm. This fragment is pecked but somewhat rough on the exterior, and very smoothly ground on the inside. It is 4.5 cm thick, and has been burned. Surface specimen.

g. Body wall fragment, 11.2 by 5.2 cm. This vessel was made of very coarse-grained sandstone, pecked on the exterior and ground smooth inside. The maximum thickness is 6.3 cm. Piece was found in the 30-40 cm level.

Small Mortars

Three crude, asymmetrical objects are classified with something less than complete assurance as small mortars. All are made from split sandstone cobbles. Only one shows workmanship on the exterior; all are modified on the interior — if at all — from battering in use. Each is described below.

a. The implement most certain to be an artifact is a fragment, about half of what was probably an oval mortar for preparation of pigment. The exterior is ground; the rim is rounded and 0.5 cm thick. The article measures 8.5 cm long and 4.8 high, as is, but it would be difficult to estimate the original length or width because of the irregular shape. The interior is cup-shaped, heavily battered, and 3.0 cm deep. It is stained with hematite. Found at 20-30 cm level.

b. Less workmanship has been devoted to this problematical specimen. It is half of a coarse-grained sandstone cobble, 11.0 cm in diameter and 7.0 cm high. The base of the cobble is so conical that the implement will not stand upright, but one naturally flat surface on the exterior allows it to rest at a sharp angle. The split surface has been battered into a rounded depression 1.8 cm deep. It is a surface specimen.

c. The third example is also a split cobble, but the stone was originally thin and flat so that the implement is low but steady. It measures 14.8 by 12.9 cm, and is 3.3 cm high. It is battered out to the edges, to a depth of 1.9 cm. The stone is coarse-grained and has been burned. Found at 10-20 cm level.

Milling Stone

The sole milling stone was found by a clam digger at the low tide watermark approximately 75 m south and 30 m west of datum. This is within the presumed area of the original occupation, before erosion of the bluff, but the artifact cannot be definitely associated with the site.

The milling stone is a natural ovoid shape with no modification of the sides or bottom. It is 38.5 cm long, 28.2 cm wide, and 11.0 cm in height. Made of sandstone, it has a long, narrow grinding basin 23.0 by 12.0 cm in dimension, and 2.1 cm deep. The depression is pecked. The long axis of the basin does not parallel the long axis of the stone but is skewed in a left-to-right direction away from the user. The implement weighs 28 pounds.

Mano

One-half of one mano constitutes the entire recovery of hand stones. If whole, this grinding tool would

be 8.0 cm in diameter and 4.9 cm thick. It appears to have been nearly round in outline. It is bifacial and well used. One grinding surface is more convex than the other, but not enough remains to recreate the total configuration and pattern of wear. Both surfaces are ground smooth and well shouldered; there is no pecking visable on the edges.

Pestles

The 17 pestles form a diverse collection. They vary from a few fragments which are symmetrically round and very smoothly ground to large, heavy, cumbersome cobbles with a minimum of modification. They have been divided into groups according to the degree of workmanship along the sides. All are sandstone.

1. Cobble pestles — 7 examples. These tools were used essentially as they were found in nature. Elongated cobbles were selected and subjected to only as much surface dressing on the sides as was necessary to trim excess stone or make the implement easier to grasp. Three are large and bulky; four are smaller.

a. Large — 3 examples. Each of these has had some pecking on two opposed sides, the rest of the circumference being naturally smooth and straight. One is broken both longitudinally and laterally; two of the quarters were recovered. All show severe battering and spalling testifying to heavy use. One of the unbroken specimens has a pecked depression encircling the stone for about ⅔ of the circumferance 5 cm down from the smaller end, giving it a phallic appearance. Two of the examples were originally longer than they now measure, continuing in use after they were broken. All tend to be somewhat four-sided rather than round in cross section.

Length: 18.5-23.5 cm
Max. diam.: 8.3-13.0 cm
Min. diam.: 6.2-10.0 cm
Weight: 2100 and 2900 g (2 ex.)

b. Small — 4 examples. Three of the smaller examples are similar in workmanship to those above, pecked on two opposed sides of a naturally suitable cobble, but of uniformly smaller size. All are of a finer grained sandstone. Two are broken. One of these shows burning and has a smoothly ground, shouldered end. The other broken specimen is also shouldered and ground, and has been flaked along one long side in addition to the pecking. The intact pestle is battered at both ends.

The fourth example shows no modification, only battering and spalling from use on both ends. Presumably, it was originally longer, but one end has been reused after a break.

Length: 10.3 cm. Fragments: 10.2, 11.4, and 12.1 cm
Max. diam.: 5.4-5.6 cm
Min. diam.: 4.0-4.8 cm

2. Tapered cylindrical pestles — 10 examples. This group has been worked on all sides to produce a tool more nearly round in cross section. All of the surface has been modified by pecking, and three fragments have been ground to a very smooth finish all around. Six are round in cross section; the others are still flattened and tend to be either oval or four-sided. All but one are broken. The one tip end found is straight across; the two pounding ends present are shouldered and ground smooth.

The sole intact pestle measures 27.5 cm long, and tapers from a maximum diameter of 8.2 cm to a minimum diameter of 6.7 cm. Diameters of the various fragments range from 1.8 cm for the tip specimen to 6.8 cm on a basal fragment.

Cobble Bar Tools

A group of carefully selected sandstone cobbles has been used as tools with little if any modification. The stones chosen are long and narrow; nine are distinctly four-sided in cross section while the others are more round. Seven are stained with asphaltum at one end. One is colored with $Fe_2\ 0_3$ on one side near the smaller end. Of the three which do not show asphaltum or hematite stain, two are battered and spalled at one end; the other is broken, burned at the remaining end, and has one pecked depression — as if for a finger grip — on each of the two opposing broad faces. Three of the implements, two with asphaltum and one without, are beveled and blunted at the working end.

Length: 11.7-23.0 cm Avg.: 16.9 cm (6 intact ex.)
Width: 4.1- 7.2 cm Avg.: 5.9 cm (10 ex.)
Thick.: 2.5- 6.0 cm Avg.: 3.5 cm (10 ex.)
Weight: 350-1400 g Avg.: 641 g (6 ex.)

Similar tools were found at Soule Park and called "tar stones" (Susia, 1962). Those found at Rancho Canada Larga were called cobble bar tools (Greenwood and Browne, 1963), as they are in this report. Although many of the implements are stained with asphaltum and doubtless were employed in the tarring industry, this is not true of all of them, and setting forth the criterion of asphaltum stain may well lead to overlooking other cobbles of the same shape and size which were used for pounding or other purposes.

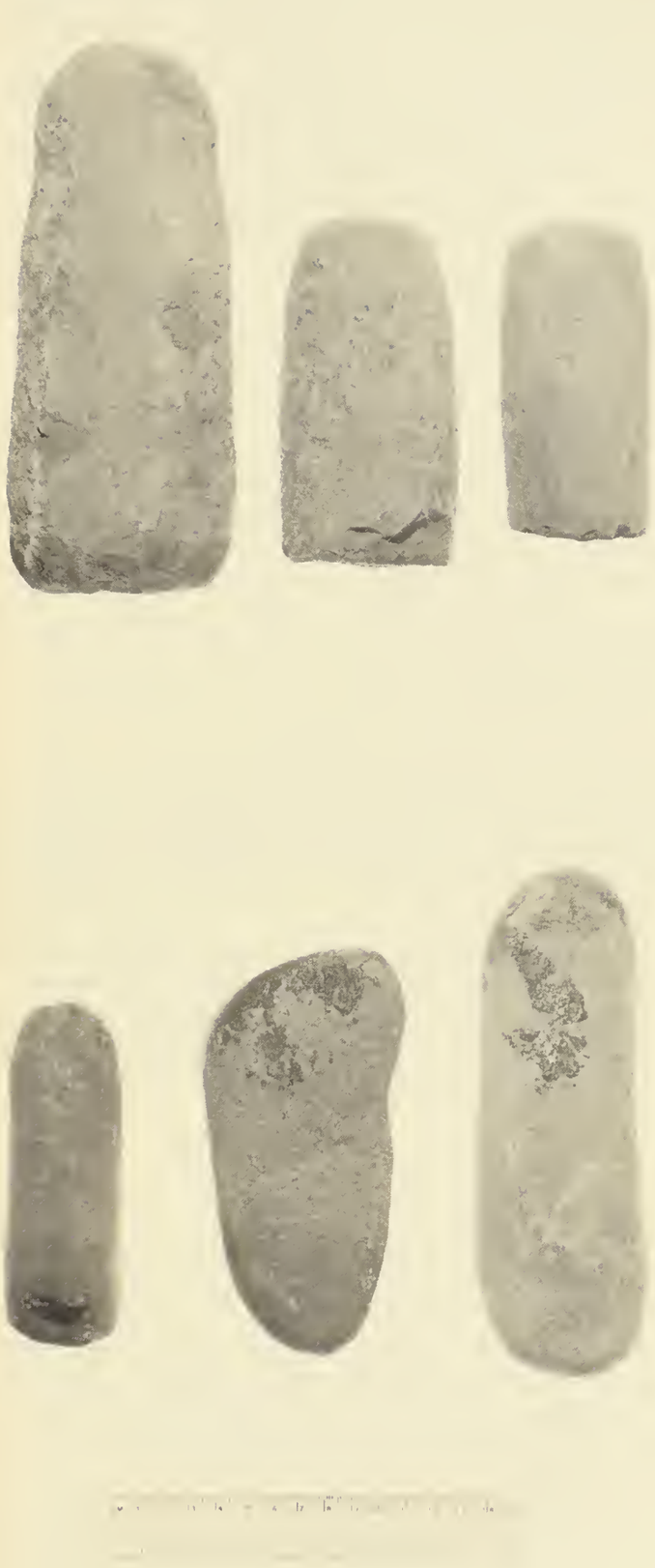


Figure 7. Pestles and Cobble Bar Tools. a. 1st row, left — Pestle, Class 1a. b. 1st row, center and right — Pestles, Class 2. c. 2nd row — Cobble bar tools.

The selection of elongated sandstone cobbles to serve as generalized tools probably antedates the use of asphaltum. After such cobbles — some 140 of them — were recovered from the Browne Site, an Oak Grove assemblage (Greenwood, in press), it became apparent that these objects were indeed rudimentary tools. They were variously blackened by fire, pecked, pitted, ground, or battered, and were regarded in this early context as proto-pestles.

The use of unmodified cobbles persisted through the occupation of Ven-3, although by this time they seem to have become specialized for the application of asphaltum. Even in this horizon, however, the differentiation between some of the cobble bar tools and some of the cobble pestles is slight. In this report, those which have been pecked along the sides are classified as pestles; the cobble bar tools have not been shaped, even though certain of them have been used for pounding.

Two of the cobble bar implements were found at the base of Feature 2, along with one asphaltum-covered pebble. These were the deepest of any artifacts found.

Beads

Nine polished stone beads were examined, three from the field work and six in private collections ascribed to the site. Seven of the total were made of serpentine, all but one with very dark, near-black color.

1. Serpentine beads — 7 examples. They fall into two categories according to size.

a. Small disk beads — 4 examples. Diameters are 0.3, 0.35, 0.6, and 0.6 cm. Thickness, in the same order, is 0.2, 0.15, 0.25, and 0.25 cm. The perforations are fairly large in relation to the diameters, 0.15 cm on the two smaller specimens. They all tend to be thicker on one side than the other.

b. Large thick beads — 3 examples. These beads measure 0.5, 0.7, and 0.9 cm in diameter, and 0.4, 0.6, and 0.5 cm, respectively, in thickness. They are biconically drilled and well polished. The lithic material of the middle-sized in this group has a distinctly blue cast.

2. Quartz bead — 1 example. This specimen is barrel-shaped, 0.8 cm in both diameter and length. The sides are slightly convex and regular. The perforation is biconically drilled, 0.4 cm across at the surface and much constricted in the center. It is smoothly polished all over. Excavated specimen, from 20-30 cm level.

3. Unidentified stone bead — 1 example. This bead, viewed in a private collection, is made of a pinkish material which looks like feldspar. It is barrel-shaped, with diameter of 0.7 cm and length of 0.6 cm. It is biconically drilled, ⅔ of the way through from one end and ⅓ of the distance from the other.

Polished Stone Objects, Bevel-edged

Seven fragments were recovered of thin, flat objects with ground, beveled edges. They are made of very fine sand shale, dark gray in color (5 YR 4/1 Munsell). The edges are worked from both sides and, where visible, the grinding marks run parallel to the edge. Four show polish; a fifth is stained with asphaltum.

The largest piece measures 8.9 by 4.9 cm. The tapered sides converge at a smooth, blunted edge, well polished. Another fragment, 5.9 by 4.6 cm, has one well finished edge similar to the former, and a more casually ground edge on the opposed side. The other pieces are smaller, each with one comparable edge. All have thickness between 0.5 and 0.7 cm.

Thin, flat objects with beveled and polished edges have been described at Arroyo Sequit (Curtis, 1959, 1963). An artifact from the Gilmore Ranch site which may be similar was called a whetstone (Wallace, 1955). The latter site is presumed fairly early because of the lack of contact or historic items, and it is worthy of note that the thin, bevel-edged objects at Ven-3 are fairly low in the deposit.

Polished Stone, Miscellaneous

Four polished stone items were found in broken condition so that precise determinations of shape and purpose cannot be ascribed. Two were probably bowls, one is a likely ornament or effigy, and the fourth may be an awl or punch.

1. Serpentine, concavo-convex — 2 examples. These are small pieces, one 1.9 by 1.6 cm, and the other 1.8 by 1.5 cm, both roughly triangular with broken edges all around. The larger fragment is 0.8 cm thick, and the smaller is 0.4 cm. Both are smooth and glossy, but thoroughly scratched, on both sides. The color is black, N 2/0 on the Munsell scale. Because of the curvature, these are probably body wall fragments of well made cups or small bowls. They were found, one each, in the 0-10 and 50-60 cm levels.

2. Serpentine, plano-convex — 1 example. This enigmatic fragment is 3.0 cm long, 1.1 cm in greatest width, and 0.8 cm thick. It has a long triangular outline in plane view, and near-triangular cross section. The end opposed to the pointed tip may or may not be broken; it is fractured but shows some grinding over the break, so it may be either original or repaired. The stone is very dark gray (N 3/0 Munsell) and scratched all over. Regarded with the flat side uppermost, the piece resembles a boat with a definite keel running down and away from a pointed prow. However, with the flat side down, it might be viewed as the forepart of a pelican stone. There is no wear on the pointed end. It is considered either a broken or unfinished ornament or effigy, and was found in the 20-30 cm level.

3. Slate, cylindrical, pointed — 1 example. This slender object is round in cross section, ground to a tapering, faceted point. It is broken, but there is 2.9 cm of the length present with diameter at the break of 0.5 cm. At the very tip, the point is more chisel-like than conical, and is slightly blunted. This artifact resembles the pencil-like object from Arroyo Sequit (Curtis, 1963), except that the Ven-3 specimen is much slimmer. It was found on the surface.

Pecked Sandstone

One flat sandstone flake has undergone extensive modification by pecking. The piece was apparently made on a cobble broken longitudinally. A band of pecking 3.0 cm wide and 0.2 cm deep in the center runs almost all the way across the more convex or upper surface; the reverse is flat. The object is broken at one end, but now measures 8.0 cm long, 5.5 cm wide, and 1.6 cm thick. It was recovered from the 10-20 cm level.

STEATITE ARTIFACTS

No unbroken articles of steatite were found, although chunks or fragments were present in almost every pit. Among the worked pieces with at least two finished surfaces were fragments assumed to represent 15 comals, seven bowls, three arrow shaft straighteners, and one possible canoe effigy. The lithic material is silvery-gray, very soft, and typical of Santa Catalina Island steatite.

1. Comals — 15 fragments. The two largest pieces will be described in detail. One measures 18.0 by 17.0 cm as is, with greatest thickness of 2.9 cm. The two corners present form obtuse angles; the edges are rounded and somewhat thinned. The implement is broken across the hole, which was biconically drilled and measures 2.5 cm in diameter. The comal is slightly dish-shaped with evidence of burning on both sides. On the convex surface there is a groove across one broken end, as if for use as an arrow shaft straightener. The implement

is 9.2 cm across at this point; the groove is 1.1 cm wide and 0.6 cm deep, with ridges from use.

The next largest fragment is 16.0 by 11.0 cm in size, 2.6 cm in greatest thickness. The surface is heavily burned and eroded, and shows old breaks. The edges present are thinned and rounded.

In addition to the example described first above, three other comals are broken at the hole, which was apparently a fragile spot. All are biconically drilled.

Other than the two large fragments already described, ten other rims were found, all with straight edges, rather than rounded. One of these was slanted outward from the top of the implement to the bottom. Excluding the same two comals described more fully, three of the corners were obtuse angles, and one was a sharp right angle. The thickness of the fragments ranged from 1.5 to 2.9 cm.

2. Bowls — 7 fragments. While none of these pieces exceeds 5.1 cm in greatest dimension, it is hazarded that the fragments may represent bowls. They are more curved than the comal fragments, and more highly polished on both sides. The only rim present is thinned and rounded. Two specimens are burned. Thickness varies from 1.2 to 2.3 cm.

3. Arrow shaft straighteners — 3 examples (1 whole, 2 broken). The intact specimen is probably reworked from a broken comal, the two plane surfaces and one short edge being flat and smooth. The long edge of this D-shaped tool shows marks of having been cut; the curved edge is a broken surface which has been smoothed. The groove runs across the short axis, is irregularly scored, 0.8 cm wide and 0.3 cm deep. Maximum length of the tool is 6.1 cm, greatest width is 3.6 cm, and thickness is 2.1 cm, which corresponds to the average thickness of the comals.

One of the fragments appears to be the corner of a comal which had a right angle and straight sides. Top and bottom are flat and well finished. The groove is a sharp trough with two right angles, 0.7 cm across and 0.4 cm deep, well polished. The fragment measures 3.6 cm long, 3.1 cm wide, and 2.2 cm thick. The groove extends across the short axis.

The third fragment may be a reused portion of a bowl. One surface is smoothly ground and slightly concave; the groove is on the opposite side which is not finished. The groove is slightly crooked but is ridged from use, 0.6 cm wide and 0.2 cm deep. The piece overall is 3.6 cm long, 3.1 cm wide, and 2.4 cm thick. The groove parallels the long axis.

4. Canoe effigy (?). One small, well-finished fragment tantalizes the viewer because too little remains to permit a categorical identification. The piece is 5.0 cm long, 3.1 cm wide, and 3.4 cm high. It is pointed, with straight sides and a flat bottom, the inside hollowed out, and all surfaces well ground. It resembles very closely the prow of a steatite effigy canoe in the Santa Barbara Museum of Natural History (Grant, 1965, Fig. 34) and similar examples from Burton Mound (Harrington, 1928, Pl. 11). Except that the fragment shows no inlay or incising on the remnant present, it is like specimens collected at Sequit Canyon and San Nicolas Island (Burnett, 1944, Pl. LXVI, esp. cat. no. 19/9397). A wooden boat of the same shape as the Ven-3 example was found on Santa Cruz Island (Wheeler, 1879, Fig. 42).

Food or cooking pots of a generalized boat shape are known to occur, but this interesting piece was probably much too small and too narrow to serve any such utilitarian purpose and is considered an ornamental or ritual object.

SHELL ARTIFACTS

Beads

The aboriginal shell bead collection totaled 3,679 specimens. The greatest number of these were disk beads made of the Purple Olive, followed by California Mussel disk beads, and a fairly wide variety of other types representing different shapes and raw materials. They tend to be poorly finished and irregular around the periphery. The beads are grouped first by shell material and within each category, by size and style. Where appropriate, the numbers of Gifford's classification (1947) follow in parentheses.

I. *Olivella biplicata* — 3,180 examples.

A. Disk beads — 2,984 examples. These beads were made from various parts of the body wall, perforated once and ground around the periphery to differing degrees of symmetry and polish. They are divided into four groups according to size, with a fifth class consisting of those which have been incised.

1. Large — 77 examples. These beads measure 0.7-1.0 cm in diameter. They are the least well finished, typically asymmetrical with off-center perforations. They are deeply concave, sometimes with shelf-like trace of the inner whorl remaining. Possibly some are unfinished. One edge may be thicker. Shapes range from round to oval. (X2b, X3bI, X3bII)

2. Medium — 374 examples. This group is 0.5 to 0.69 cm in diameter, and tend to be more nearly round than the above. They are concave. Holes may be well-centered or off-center, and one edge is often thicker. (X3bI)

3. Small — 2,379 examples. This, the largest category of any artifact on the site, measures 0.3-.49 cm in diameter. The beads range from flat to slightly concave, from asymmetrical to very well rounded. The perforations fall within the 1-3 mm range. (X3bI) In addition, there are 26 other beads within this size classification which are described separately below because they are incised.

4. Very small — 128 examples. This group measures 0.2-0.29 cm in diameter and despite their tiny size, are the most regular, symmetrical, and well finished. Nonetheless, some are concave, and some are thicker at one edge. (X3bI)

5. Incised — 26 examples. These beads are all between 0.3-0.5 cm in diameter, and are incised on either the face or edges. Of them, 14 are engraved with fine oblique lines around the periphery; the parallel lines cover the edges and extend over onto one face of the bead. (X5a). Eleven beads are decorated with a cross-hatched pattern on the edges, (X5b) One has a herringbone or chevron pattern on the edges, not described in Gifford. Of the incised beads, 16 are clearly stained with asphaltum. It is possible that the black material was rubbed into the incisions to emphasize the pattern, but the presence of tar within some of the perforations and on one face of certain beads suggests that at least some of this group may have been used for inlay work.

B. Half-shell beads — 50 examples. This class includes the crudest of the *Olivella* beads. They are large, asymmetrically oval to sub-round, with off-center perforations. They have been made from longitudinal body wall sections with a minimum of grinding around the periphery. Sizes range from 1.1 to 2.3 cm. (XIb)

C. Whole shell beads, spire missing — 143 examples. The size of the opening varies from a mere pin-hole to an aperture of 0.5 cm or more created by the removal of several whorls. Of the group, 81 spires were clearly ground away; the others are too eroded or weathered to reveal workmanship. Sizes range from 0.6-2.7 cm in length. Ten specimens have an additional hole through the body wall of the shell, but it is not clear whether such perforations are a result of human effort or marine predators. (F5b)

D. Cup-like beads, spire missing and rest of shell cut away — 3 examples. On two specimens, the spire is simply missing; the third spire has been ground off. Two beads are ground so that a trace of the lip remains and whorl walls are visible inside. (G1b) The other is made from a higher portion of the spire, shows no lip and only a trace of the suture. (GIc)

II. *Mytilus californianus* — 317 examples.

All of the beads made from this shell are disks, and they have been divided into the same size categories as those made from the Purple Olive. Mussel beads may be either pink or gray, depending on the part of the shell from which they were cut; 177 of the total are distinctly pinkish. The remainder are gray and although all reasonable care was taken in the analysis, it is possible that certain of them may be burned beads of other shell species. The mussel beads are mostly thick and asymmetrical.

A. Medium — 36 examples. This group measures 0.5-0.69 cm in diameter. Some are as much as 0.3 cm thick.

B. Small — 279 examples. These beads are 0.3-.49 cm in size. They otherwise conform to Gifford's V1aV, except that he specified a maximum diameter of 0.3 cm.

C. Incised — 1 example. This bead, of medium size, has five faint radial lines arranged in sun-burst pattern on one face. Diameter is 0.6 cm; thickness is 0.25 cm.

D. Sub-rectangular — 1 example. This specimen is flat on two long sides and convex on the two short ends. It measures 0.5 by 0.7 cm, and is 0.2 cm thick. In shape it resembles Gifford's Vic, although his example is made of a different shell.

III. *Tivela stultorum* — 104 examples.

Most of this group is without doubt made from the Pismo clam, but it should be noted that a few may represent other species. They are divided into disk beads, with the same size categories as employed above, and tubular beads, wherein the length exceeds the diameter.

A. Disk beads — 95 examples.

1. Large — 1 example. Diameter is 0.8 cm; thickness is 0.4 cm.

2. Medium — 7 examples. The group varies from 0.5-0.65 cm in diameter and 0.2-0.35 cm in thickness.

3. Small — 87 examples. These beads measure 0.3-0.49 cm in diameter and vary from 0.2-0.4 cm in thickness. (VIb1)

B. Tubular beads — 9 examples.

1. Short — 2 examples. The length of these beads equals or exceeds the diameter. One is 0.4 cm long, with the same diameter. The other is 0.8 cm long and 0.5 cm in diameter. Both are biconically drilled. The ends of both specimens are ground,

so it is not assumed that these are broken fragments of the group below.

2. Elongated — 7 examples. Unfortunately, only one of this group is unbroken, but from this intact specimen, it is possible to reconstruct the shape, size, and intent of the others. The group contains undrilled blanks and broken, drilled fragments. The whole bead is 6.3 cm long and 0.7 cm in diameter at the mid-point. It is slightly curved, following the arc of the shell, beveled at both ends, and well polished. It is undrilled, but at one end, the beginning of a perforation is visible.

The six fragments range from 1.0 to 3.2 cm in length. Four have one beveled end present. The greatest diameter is 0.9 cm. Only two are drilled. One of these has an off-center perforation of remarkably uniform bore, 0.1 cm at either end. The other drilled fragment has two holes. One, well off-center, had been abandoned at 0.3 cm depth; a second attempt was successful. This perforation is dangerously close to the edge of the tube, biconical, and 0.2 cm in diameter. Three fragments were found in the same pit. (AV1a, undrilled, and AV2b, drilled)

A necklace of similar elongated beads with beveled ends may be seen in Los Angeles County Museum of Natural History, in the collection from Arroyo Sequit (Cat. no. A5600/118). Others of the same material, size, and style have been found at Burton Mound (Harrington, 1928, Pl. 26k) and at La Patera (Wheeler, 1879, Pl. 13, 36-8).

IV. *Dentalium neohexagonum* — 35 examples. This group varies in length from 0.4-2.1 cm. Some of the ends are cut and ground, while others are broken. (B1)

V. *Conus californicus* — 25 examples. These are whole shells with the spire either deliberately ground off, as on six of the specimens, or the spire broken or eroded away, as is the case with 18 of the shells. (F3) One example retains an intact spire, but has a perforation drilled through the side body wall just below the shoulder by either a human or marine predator. The lengths vary from 1.5 to 3.0 cm.

VI. Columella — 6 examples. This is a motley group of largely unidentified, broken specimens, all of which seem to be made by grinding away the whorls of univalves. One specimen is a fragment of what must have been a large tubular bead, most likely *Polinices reclusianus*. It is perforated longitudinally; present length is 2.2 cm, with diameter of 0.9 cm. (AU3) A similar artifact was found on the surface, the center tube of the same shell, 5.4 cm long, 0.95 cm in diameter, perforated longitudinally, and well polished all over.

Two fragments were badly eroded, but represent some small species; present lengths are 1.8 and 0.6 cm, and diameters are 0.5 and 0.3 cm, respectively, perforated longitudinally. A fourth example is complete and polished all over, with a small angled hole; length is 2.5 cm, diameter, 0.5 cm.

The sixth example is nearly whole. From size and configuration, the shell may be *Mitra idae*. Instead of a longitudinal perforation, this bead is partly drilled through cross-wise from both sides at the broader end. The present length is 2.4 cm, and diameter is 0.4 cm. (AU2)

VII. *Fissurella volcano* — 3 examples. These beads or ornaments were made by utilizing the natural apical opening of the shell and cutting away most of the remainder. In the largest specimen, the hole has been artificially enlarged and rounded. Only one example has been ground around the edges to form a smoothly oval artifact. They measure 0.9 by 1.1 cm, 0.8 by 1.1 cm, and 0.4 by 0.5 cm. (H3)

VIII. *Norrisia norrisii* — 2 examples. Two disk beads were found of this material, nacraeous on one side. One is 0.4 cm in diameter (small) and the other is 0.6 cm (medium). Both are symmetrically round, with one well-centered perforation. The larger appears to be biconically drilled; the smaller is drilled straight through from the convex surface.

IX. *Polinices reclusianus* — 1 example. This specimen was made from a whole juvenile Southern Moon shell, 1.3 cm long. Two holes have been drilled on the large whorl nearer the umbilicus than the spire. The perforations are 0.2 and 0.25 cm across, and are 0.4 cm apart. (C25)

X. *Diodora aspera* — 2 examples. These rings are oval in outline, with excess peripheral shell cut away. One measures 0.6 cm and 0.4 cm wide; it has been ground very thin and the apical hole enlarged. The other is 0.8 cm by 0.4 cm, with the natural hole not enlarged and the outer edge only roughly ground. (H2a1)

XI. *Hinnites multirugosus* — 1 example. This is an undrilled tubular form or bead blank, made from the purple hinge area. The unbroken end is beveled, resembling the unfinished tubes in III B 2 above. Present length is 1.8 cm, width is 0.5 cm. (AV1c)

XII. Miscellaneous and unidentified — 3 examples. One of these is a short tubular bead with length

Figure 8. Shell Beads and Ornaments. a. 1st row, 1st 4 ex. and extreme left — Ornaments, class 4h. b. 1st row, 5th ex. — Ornament, Class 4f. c. 2nd row, 1st ex. — Ornament, Class 4c. d. 2nd row, 2nd and 4th ex. — Ornaments, Class 4a. e. 2nd row, 3rd ex. — Ornament, Class 4b. f. Top, extreme right — Ornament, Class 4i. g. 3rd row, 1st 2 ex. — Ornaments, Class 3b. h. 3rd row, 3rd ex. — Ornament, Class 2. i. 3rd row, 4th ex. — Ornament, Class 1. j. 3rd row, last 4 ex. — Beads, Class IIIB2. k. 4th row, 1st 3 ex. — Beads, Class V. 1. 4th row, last 4 ex. — Beads, Class IC. m. 5th row — Beads, Class IA 1-4.

and diameter of 0.6 cm. The perforation is large, 0.3 cm across. The other specimen found in the same level of the same pit is a fragment of what seems to be the identical style and size, with perforation only slightly smaller.

The third example is a disk bead 0.7 cm in diameter and 0.4 cm thick, drilled straight through. It is doughnut-shaped with rounded sides.

All three of this group may be the same raw material, a tan shell with slight luster.

Ornaments

The distinction between beads and ornaments is, of course, only a matter of convenience and subjective opinion. Described here as ornaments is a group of 25 artifacts which are larger, diversely perforated or ground, and a variety of objects made of abalone shell.

1. *Olivella biplicata* — 1 example. This shell is 2.5 cm long and 1.9 cm in greatest diameter. The spire is missing, and there are two holes, either punched or adventitious, on the body wall of the main whorl. On the opposite side, a large rectangular area, 0.9 by 1.4 cm, has been cut away from the body wall, revealing the interior architecture. The edges of this opening are ground smooth. (C23b)

2. *Ocenebra poulsoni* — 1 example. The shell is nearly its original length, lacking only some of the lipped end. The spire is intact. On three sides, parts of the body wall have been cut away to reveal the inner architecture, and the edges of the cuts are polished. The fourth side is not opened but is ground smooth so that the shell has a rectangular cross section. Length is 3.5 cm; cross section measures 1.0 by 1.6 cm.

3. *Cypraea spadicea* — 3 examples.

a. Whole shell — 1 example. This shell has been ground through on the lower body wall opposite to the teeth, at the lip end. The irregular window resulting averages 0.5 cm in diameter. The shell is 4.1 cm long and 2.4 cm in diameter. (Possibly H1a in process of manufacture)

b. Half lip — 2 examples. Teeth are present on both specimens, and the opposing long sides are well ground down. One example is worked to a point at one end. Lengths are 3.7 and 3.8 cm; widths are 0.8 and 0.9 cm. (H1b) Neither is perforated.

4. *Haliotis* sp. — 20 examples. In all cases where the shell is identifiable, it is *Haliotis cracherodii*. This is the only abalone which has been found in the midden.

a. One-hole beads or disks, round — 3 examples. This group measures 0.5, 0.9, and 1.7 cm in diameter. The epidermis is present on the two smaller items, removed from the largest. All are biconically drilled, with perforations well centered. The outlines are not symmetrically round and not well ground. (K1al)

b. One-hole bead or disk, round, incised — 1 example. This disk is 1.2 cm in diameter, slightly concavo-convex, with epidermis removed. The perforation is well centered and biconically drilled. The edges are ground to a symmetrical circle, and are incised with fine lines all around the periphery. (K1b)

c. One-hole trapezoidal ornament — 1 example. The specimen is 1.6 cm long and 1.1-1.3 cm in width. It is slightly cupped, with epidermis covering all of one face. The perforation is slightly above the center toward the narrower end, biconically drilled. The two long sides and narrow end are straight; the flared end is convex. (Q1a)

d. One-hole ornament, fragment — 1 example. This example, presumably round, differs from a. above in having a peripheral perforation, 0.5 cm in from the margin of the shell. Present size is 3.1 by 2.8 cm. (K2aI ?)

e. Two-hole button or bead — 2 examples. These are flat disks with two central perforations. One measures 1.4 cm in diameter, epidermis removed. The other is more oval, 1.2 cm long and 0.7 cm wide, with some epidermis remaining. The round specimen is broken through the holes. The other has biconically drilled perforations 0.2 cm in diameter. (K3aI)

f. Two-hole button or bead, incised — 1 example. This specimen is well rounded with fine lines incised all around the border. It is 1.7 cm in diameter, ground very thin (0.15 cm) with all epidermis removed. The biconical perforations are well centered and measure 0.3 cm in diameter. (K3bIV)

g. Four-hole ornament, rectangular — 1 example. This object measures 2.1 by 1.1 cm, with paired perforations at both narrow ends. All four sides are slightly convex, possibly through erosion of the corners. Epidermis is present on the reverse. Two corners have broken away through the holes, which were drilled through from the nacraeous face. (S15a)

h. Undrilled blanks — 9 examples. This group includes pieces of abalone shell which have been cut and shaped to some degree, but not perforated. All but one have epidermis remaining. Five are round or nearly so; the diameters of these are 0.7, 1.1, 1.4, 1.7, and 1.8 cm. The two smallest are symmetrical and well ground around the edges. The next largest example shows the beginning of

a perforation in the center. One has a thick incrustation of asphaltum on the epidermal surface.

The other four blanks are tear-drop to oval in shape. Two, which measure 1.2 by 1.8 cm and 1.4 by 1.8 cm, are not finished on the edges. Two others are well ground trapezoidal shapes. One of these is 1.6 cm long and 1.4 cm in greatest width, and the largest of the group is 3.1 cm long by 2.7 cm in greatest width.

i. Crescentic pendant — 1 example. This specimen was made from the flat curved rim of the shell by cutting away all trace of the main whorl. It has one biconical perforation at the broad proximal end; the other end is tapered to a point. All edges are smoothly ground. The length is 5.6 cm; width at the broad end is 0.6 cm, and thickness is 0.2 cm (AP2aII)

Fishhooks

Out of the 46 whole, broken, and incomplete shell fishhooks from Ven-3, the most typical specimen was a small, fragile mussel hook of circular design. Most of them had a diameter of about 1.5 cm. Every shank end which was present was grooved on both sides. The collection is described in terms of the amount of artifact found, shell species utilized, size, and degree of completion. All fall within Gifford's category AT2c for circular fishhooks, knobbed or grooved shank. They also correspond to Heizer's type 2 (1949: 90) or Robinson's type 1 (1942: 60).

I. *Mytilus californianus* — 24 examples.

A. Small — 23 examples. Although all but one of these are broken to some degree, none would have an estimated measurement in any direction in excess of 2.0 cm, and most are considerably smaller. The average width along the curved shank is 0.3 cm, and average thickness is 0.25 cm.

1. Whole — 1 example. The specimen measures 1.3 cm in length, 1.2 cm in width, 0.2 cm across the shank, and 0.2 cm thick. The diameter of the central perforation is 0.9 cm. Weight is 0.15 g. The shank has a groove on both sides which is 0.8 cm long.

2. Shank fragments — 6 examples. These are presumably comparable to the hook described above. Estimated lengths range from 1.5 to 2.0 cm, and widths from 1.4 to 1.5 cm. All have grooves on both sides of the shank, 0.9-1.1 cm long. The largest of these has a small notch at either end of the groove.

3. Point fragments — 2 examples. These must have been small hooks with estimated lengths of 1.2 and 1.3 cm. The larger tip is tapered to a point only on the outer, or convex, aspect. The smaller is ground down on three sides to form the point, only the inner, or concave, surface being left unground after the original perforation.

4. Body fragments — 14 examples. These specimens lack both grooved end and point, but appear comparable in size to those above. Where possible to extrapolate, the diameters of the central perforations range from 0.7 to 1.0 cm.

B. Large — 1 example. This is a body fragment of a fishhook estimated to have been 3.0 cm or more in length and perhaps 2.5 cm in width. The width across the curved portion is 0.9 cm, thickness is 0.4 cm, and weight (as is, about ½ present) is 1.7 g. The diameter of the central perforation would be 1.5 cm or more, biconically drilled.

II. *Haliotis* sp., large — 1 example. If unbroken, this would be the largest fishhook of the collection. Length is estimated at 3.8 cm, with width of 3.2 cm. The shell is 1.0 cm wide along the curve, and 0.6 cm thick. With about ⅔ present, the weight is 3.0 g. There is a groove 2.0 cm long on both sides. A distinct trace of asphaltum with the impression of cord wrapping is visible on the upper one-half of the shank.

III. Partially completed fishhooks — 12 examples. On all of this group, the perforation has been drilled and one side cut or broken away to form an opening. Five have had some grinding done to finish the sides; one has the point completed. Six are biconically drilled. Of two which are drilled straight through, one was perforated from the epidermal side and one from the nacraeous side.

A. *Mytilus californianus* — 10 examples. All would fit comfortably within the "small" category, with central perforations of 0.5-0.7 cm.

B. *Astraea undosa* — 1 example. This specimen is somewhat larger than the typical mussel hook. The perforation is 1.1 cm across, and the completed artifact would possibly have been about 2.5 cm in length.

C. Unidentified shell *(Norrissia norrissii?)* — 1 example. This would have been a small hook, with central perforation of 0.9 cm and estimated length of 2.0 cm. The sides of the curved portion have been ground smooth, although there is still one square corner.

IV. Blanks — 9 examples. Three of these have been perforated, but the central hole has not yet been opened out to one side. The other six are subrectangular, undrilled pieces of shell which appear to be raw material chosen or created for making fishhooks.

Figure 9. Fishhooks of Shell and Bone. a. 1st and 2nd rows — Shell, Class IA 1-4. b. 3rd row, 1st ex. — Shell, Class II. c. 3rd row, 2nd ex. — Shell, Class IIIb. d. 3rd row, last 4 ex. — Shell, Class IIIA. e. 4th row, 1st 2 ex. — Shell, Class IVAl. f. 4th row, 3rd ex. — Shell, Class IVA2. g. 4th row, last 4 ex. — Shell, Class IIIA. h. 5th row, 1st 6 ex. — Bone, Class 2. i. 5th row, 7th ex. — Bone, Class 1.

A. Perforated — 3 examples. All would make small fishhooks.

1. *Mytilus californianus* — 2 examples. These measure 2.2 and 2.8 cm in average dimension, with perforations of 0.9 and 1.0 cm. The smaller is biconically drilled, mostly from the nacraeous side. The perforation of the larger specimen may not be finished; it is drilled from the nacraeous side only. Neither shows any workmanship on the sides.

2. *Astraea undosa* — 1 example. The material measures 2.0 cm in diameter, with perforation of 0.9 cm. The hole is drilled from the interior side of the shell only, and possibly is not completed.

B. Unperforated — 6 examples. These are all sub-rectangular in shape, and suitable in size for the manufacture of small hooks.

1. *Mytilus californianus* — 5 examples. These undrilled pieces range in size from 1.4 by 1.9 to 2.0 by 3.2 cm. One has had some grinding on the edges.

2. *Haliotis* sp. — 1 example. This blank is broken; one unbroken edge measures 2.1 cm. It is included here because one edge shows grinding, and the size and shape is comparable to those above. It also could have been intended for an ornament.

Two aspects of this collection are worthy of emphasis — the size of the fishhooks and the choice of shell involved. Aside from the two exceptions noted, all of the other 46 hooks, fragments, and blanks are distinctly smaller, 1.0 to 2.0 cm in length, than the usual reported elsewhere. In the two Arroyo Sequit publications, Curtis (1959; 1963) found only one out of the total of 112 hooks described which would be as small as these. At Burton Mound, only one (Harrington, 1928) and from San Miguel Island, only one illustrated (Heye 1921, Pl. XCVIII) would match the small specimens from Ven-3. At the other sites, the typical hook was about 3.0 cm long and often more, with greater width and thickness as well.

One tends to speculate whether some of the fishing was done in the Ventura or Santa Clara Rivers rather than in the open ocean, which might account for the delicate apparatus. Identification of the fish bone will eventually confirm or disprove this notion; preliminary sorting of the bone seems to indicate that most of the remains are marine. Results of the fish-length curves to be derived from the otolith study will help determine the actual size of the fish caught and the suitability of the small hooks.

The other distinguishing feature of the Ven-3 collection is the great preponderance, almost exclusive use, of mussel shell for fishhooks. Only one hook and one blank were abalone. At Burton Mound, every one of the 121 hooks and fragments was abalone (Harrington, 1928). The quantities on San Miguel are not so clear, but apparently abalone hooks were more common than mussel (Heye, 1921). At Arroyo Sequit, some 27 miles from Ven-3, mussel hooks predominated, but abalone hooks still constituted 20 per cent of the total sample from both digs (Curtis, 1959; 1963). The abalone makes a sturdier hook (Robinson, 1942).

In her discission of the small collection from Deer Canyon (four hooks and five blanks, all mussel), Wissler (1958) suggests that the use of *Mytilus* may be restricted to the very central portion of the presumed Chumash area, and her Type 8 hook (circular, mussel, unbarbed, with grooved shank) seems to predominate in the area between Rincon and Pt. Mugu. The distribution at Ven-3 is in accord with this theory, both in regard to shell material and style of hook. The greater use of abalone and the other variety of shank and barb in both the northern and southern extensions of this area may represent survivals from older customs.

Containers

There is no way of knowing how many of the whole and broken shells within the deposit may have been used as containers, dishes, scoops, or other utensils. At least five may be so classified with some certainty because they contain asphaltum, and two others with more doubt because they have edges which have been cut and ground.

1. *Haliotis* sp. — 4 examples, all fragmentary. From three of these, all of the epidermis has been removed. The fourth is *Haliotis cracherodii*, and it is assumed that the others are, as well. One must have been a notably large and thick shell, since the rim fragment measures 13.5 cm in its broken condition. This piece still has the asphaltum plug in one siphon hole. Two of the smaller specimens contain sizeable deposits of asphaltum, and the fourth shows asphaltum stain within the holes.

2. *Balanus nubilis* — 1 example. This large barnacle still contains an appreciable quantity of asphaltum. It is not obvious whether the massive shell was first split and then used as a container, or whether it was employed whole and broke at a later time. About half of the original shell is present. The piece is 9.7 cm long, 8.4 cm wide, and 3.5 cm thick. No other trace of this shell was found in the midden.

3. *Hinnites multirugosus* — 1 example. The purple hinge area has been ground down and the

edges reduced to a present measurement of 8.0 by 6.2 cm. The shell, which is usually highly asymmetrical in nature, is now sub-rectangular in outline. It shows no asphaltum, but is of a suitable concavity to serve as a container.

4. *Cypraea spadicea* — 1 example. The body wall of the shell opposite the lip has been cut into ovoid shape, with all edges ground smooth. It measures 3.8 by 2.7 cm. It is possible that this represents an unfinished ornament, although no counterparts are cited in Gifford or other reports.

BONE ARTIFACTS

The distinction between single-pointed bone implements which have been variously called awls, pins, daggers, hairpins, nose pins, wands, gouges, punches, and almost as many other names as there are writers, is clouded by the intergradation of tools within the hypothetical categories, the frequent lack of precise definition or description, and uncertainty of the artifact's real function. Where possible, an effort will be made here to follow Gifford's general numerical classification although the nomenclature is not always accepted. The number and letter categories are those employed in his 1940 publication. In addition to pointed tools, the bone inventory of 125 items includes wedges, beads, fishhooks, and miscellaneous objects.

Awls

In this report, the term awl refers to an elongated bone implement without eye or groove, which tapers more or less gradually to a sharp point. The group numbers 60, 45 from the excavations and 15 examined in private collections.

A1a1. Awl of deer canon bone, with distal end intact to serve as handle — 1 example. The tool is complete, polished, and shows transverse striations about the tip. It is 7.0 cm long, 2.6 cm wide at the handle, and weighs 11.5 g.

A1b1. Awl of deer canon bone, with one-half of split distal end remaining to serve as handle — 3 examples (2 whole, 1 frag.) The largest specimen is very highly polished all over, 18.8 cm long, 2.1 cm wide at the handle, and 0.4 cm thick along the shaft; it weighs 14.7 g. The other intact example still shows polish although it is a very eroded surface specimen. It measures 7.5 cm long, 1.8 cm wide at the handle, and the tip has been cut back for a distance of 3.0 cm from the point to thin the shaft. The fragment is a handle.

A1c. Awl with head of bone partly worked down — 5 examples (2 whole). The larger unbroken specimen is 11.7 cm long, 1.9 cm wide at the handle, 0.8 cm thick along the shaft, and weighs 10 g. The other measures 9.4 cm long, 1.5 cm wide at the handle, 0.7 cm thick along the shaft, and weighs 9 g. The fragments are handles of similar conformation and size; all show polish.

A1e. Awl of mammal leg-bone splinter — 2 examples (1 whole). These tools are much more slender than those above, with a width only slightly greater than the thickness. The intact example may once have been a perforated needle, as the end opposite the point has been broken and reground. It now measures 12.8 cm in length, 0.7 cm in width, and 0.5 cm in thickness. The broken tool is 6.1 cm long as is, 0.7 cm wide, and 0.6 cm thick. Both are triangular in cross section at the mid-point.

A1f. Awl with asphaltum handle — 4 examples (3 whole). All of these have a knob of asphaltum covering the articular end of the bone. One appears to be made of land mammal rib and one of tibia. The excavated specimen weighs 6.3 g.

Length: 6.4, 7.4, and 9.2 cm.
Width of shaft: 1.2, 0.8, and 1.0 cm.
Thick. of shaft: 0.4, 0.6, and 0.6 cm.
Width of handle: 1.4 and 1.7 cm.

A4. Awl of bird bone — 3 examples. These hollow tubes have been cut obliquely at one end to form a point which is subsequently ground very smooth. All are polished. Unfortunately, all are missing at least a little of the handle end, so more refined classification is not possible. One has transverse striations and traces of asphaltum. Similar specimens from San Clemente Island were called marrow extractors (Wheeler, 1879).

Length:	6.2, 6.9, and 8.1 cm (as is)
Diam.:	0.3, 0.8, and 0.8 cm

A5a. Awl of Stingray spine — 1 example. This tool, from *Myliobatis californicus*, has had the spines ground down for a distance of 1.8 cm to form a point. There is a minute notch, less than 1 mm, across the very tip. Present length is 3.5 cm, greatest width is 0.5 cm, and the thickness is 0.3 cm.

Miscellaneous awls.

1. Whole — 3 examples. These were surface specimens inspected and measured in private collections, but not retained for classification.

Length:	5.5, 8.0, and 9.6 cm
Width:	1.3, 0.7, and 0.7 cm
Thick.:	0.6, 0.6, and 0.6 cm

2. Tip fragments — 21 examples. Of the group, 12 are burned and four appear to be resharpened. Two similar specimens are made of notably heavy bone which is 0.7 cm thick; both of these have beveled edges, extending all the way to the break on one tool, and some grinding at the broken base.

3. Median fragments — 10 examples. Eight of these are burned. They vary in width from 0.6 to 1.4 cm.

4. Bases or handle fragments — 7 examples. Three of the pieces have articular ends of bone intact, two are partly cut away, and two are completely worked down. One specimen is mammal radius.

Punches

This group which Gifford also calls pin, knife, or dagger (B) differs from the awls in having a broader, blunter tip. The points are not sharp, and do not seem suitable for making coiled basketry. Similar instruments have been called punches at Arroyo Sequit (Curtis, 1963). There were seven examples, one whole and six tip fragments.

The whole specimen has oblique striations on both flat surfaces, and is heavily stained with asphaltum. The articular surface of bone at the handle end is entirely ground away. The tool is 9.0 cm long, 1.1 cm wide, and 0.6 cm thick. The fragments appear similar. One has slight traces of asphaltum and transverse striations at the tip.

Flakers

These tools are characterized by blunt, rounded tips, usually conical. They are sturdy, solid, strong, and relatively heavy. The group corresponds to Gifford's C series which he calls gouges or smoothers. Similar tools were recognized as pressure flakers by Heye (1921). The collection includes 12 examples, three unbroken and nine tip fragments. Two of the fragments are made of antler.

The longest of the intact tools has an undercut tip which is highly polished and well worn. The other two are made of very heavy split bone. Three of the fragments are made of curved rib sections with highly polished, rounded tips.

Length:	6.2, 10.0, and 13.5 cm
Width:	1.7, 1.4, and 1.0 cm
Thick.:	0.7, 1.1, and 1.0 cm

Wedges

Whether called knife, chisel, end scraper, pry, or wedge, the group consists of flat, end-bladed tools. As distinct from awls or other classes with tapering or conical points, the tips of this group are two-sided or wedge-shaped, spatulate, with straight to slightly convex ends. There are six examples, all broken.

Two resemble Gifford's D6, made from whale bone. One is a large fragment measuring 12.0 by 4.3 by 1.4 cm. The other is smaller, 8.5 by 3.0 by 1.5 cm, with one end beveled so that the resulting wedge is at an angle to the flat surface of the shaft.

The four fragments of land mammal bone are all highly polished and all burned. The two larger tools are both split longitudinally but would have been large, heavy implements in excess of 2.0 cm wide. The other two are smaller, with complete widths of 0.8 and 0.9 cm. Antler wedges are discussed below.

Gaming Pieces (?)

Four pieces of cut land mammal rib were recovered. Their use as gaming pieces is suggested by Gifford (S), although they could have served as well as net spacers or gauges.

The largest, which shows marks of cutting at one end, is 7.3 cm long, 2.7 cm wide, and 0.8 cm thick. A smaller piece is cut at both ends; it is 2.4 cm long, 2.7 cm wide, and 0.4 cm thick. It shows some polish and random scratches on both sides. The third specimen is cut at one end and broken at the other; present length is 2.7 cm, width is 2.0 cm, and thickness is 0.5 cm.

The fourth example is an elongated specimen from a distinctly smaller animal. There is some transverse incising on one surface. With both ends broken, it now measures 5.2 by 0.9 by 0.4 cm.

Bipointed Objects

Three bone objects were pointed at both ends. Possible uses which have been suggested for similar artifacts include hairpins, nose sticks, fishing equipment, awls, and fasteners.

1. Bipointed slender object, nearly round in cross section, slightly bowed — 1 example. The tool is 9.7 cm long, with a fairly constant diameter of 0.4 cm for most of its length. There is a band of asphaltum stain 2.3 cm wide extending all around the artifact, not at the exact middle but about two-thirds of the distance away from one point. (T1a)

2. Bipointed short object, almost diamond-shaped with greatest width below mid-point — 1 example. This tool is rectangular in cross section. It is made of heavy bone 0.5 cm thick, and is 4.8 cm long and 0.8 cm in maximum width. Both ends are beveled to a point, one more abruptly than the

Figure 10. Bone Artifacts. a. Top — Ceremonial or Decorative Object. b. 2nd row, 1st 4 ex. — Beads, Class 2. c. 2nd row, 5th ex. — Gaming piece(?). d. 2nd row, 6th ex. — Perforated bird claw. e. 2nd row, 7th ex. — Perforated turtle shell. f. 3rd row, 1st ex. — Antler wedge or chisel. g. 3rd row, 2nd ex. — Wedge. h. 3rd row, 3rd ex. — Bipointed object, Class 2. i. 3rd row, 4th ex. — Bipointed object, Class 1. j. 3rd row, 5th ex. — Bipointed object, Class 3. k. 3rd row, 6th ex. — Gaming piece(?). l. 4th row, 1st 4 ex. — Flakers. m. 4th row, 5th and 6th ex. — Punches. n. 5th row, 1st ex. — Awl, Class Ale. o. 5th row, 2nd ex. — Awl, Class Alc. p. 5th row, 3rd ex. — Awl, Class A4. q. 5th row, 4th ex. — Awl, Class Alf. r. 5th row, 5th ex. — Awl, Class Alal. s. 5th row, 6th ex. — Awl, Class A1b1. t. Extreme right, vertical — Object of Swordfish bill.

other. Gifford suggests that similar objects may be parts of a harpoon toggle, perhaps the central point. (T1f)

3. Bipointed object, round in cross section, asphaltum around the middle — 1 fragment. The classification of this artifact is hypothetical since both ends are missing, but it resembles Gifford's examples in this group both by description and illustration. As is, the tool measures 5.7 cm in length and 0.8 cm in diameter. A thick band of asphaltum encircles the piece for a distance of 3.4 cm. The end which is the more complete is beginning to taper to a point 1.8 cm above the asphaltum. This object would resemble 1. above, except that the latter is bowed along its length and this one is straight. (T2b2 ?)

Antler Wedge or Chisel

One implement was found with a well thinned and polished, wedge-shaped tip. The length is 8.2 cm, diameter at the handle end is 3.0 cm, and weight is 34 g. Ethnological uses for similar examples include splitting planks and forcing out chips when felling trees. (HH)

Miscellaneous Splinters

A group of six small artifacts does not seem to fall within any of Gifford's categories. Three are thin splinters of land mammal bone, finely pointed at one end and broken at the other. One has a spot of asphaltum at the tip, and another is burned. Lengths of the remnants are 1.3, 4.0, and 4.8 cm. Greatest widths at the break are, respectively, 0.4, 0.3, and 0.4 cm.

The other three appear to be fish bone, with at least one fine, polished point. Only one is complete; this is apparently bipointed, 1.9 cm long and 0.4 cm in greatest diameter near the mid-point. One tip is more tapered than the other. The second example is lacking one end. It measures 2.4 cm in length as is, and 0.4 cm in diameter. There is some notching or grooving on one side near the broken end. The third specimen is also broken at one end; the remnant measures 2.1 cm in length and 0.3 cm in width. All three appear to be made of the same raw material. (A5b ?)

Ceremonial or Decorative Object

The one specimen in this category most resembles those in Gifford's K series, called ceremonial wands, although it does not fit neatly within any one subgroup. It is made of land mammal rib, ground down on one side for most of the length to reveal

the interior cancellous bone. One end is tapered to a broad point. The articular end is widely flared, with the bony architecture ground away. Within the hollow at this handle end is a heavy deposit of asphaltum which still retains the imprint of the stone, crystalline, or shell ornamentation it once held. The pointed end shows some random cross-hatch incising and traces of asphaltum. The object is bowed in profile. Overall length is 23.5 cm, greatest width at the handle is 5.5 cm, width at mid-point of the shaft is 2.3 cm, and thickness of the shaft is 0.6 cm. It weighs 35.7 g.

A similar specimen, with a quartz crystal embedded in the asphaltum at the blunt end was found under a skull on San Miguel Island, and was assumed to be a hair ornament (Heye, 1921: 95-6 and Pl LIXa). Other inlaid, embedded, and incised hair ornaments are known from the Malibu area (Burnett, 1944: 49-53, Pl. LVIIIa).

Perforated Bird Claw

The perforated claws in Gifford's class VV were all the terminal phalanges of eagles; the one specimen from Ven-3 has not been identified as to avian origin. It is 3.9 cm long and 1.2 cm wide at the proximal end. It is biconically perforated, with a trace of asphaltum within the hole.

Similar examples are known from Burton Mound (Harrington, 1928), and San Miguel Island (Heye, 1921).

Fishhooks

Nine specimens of bone fishhook were recovered, three of circular design and six of the straight or composite variety.

1. Circular — 3 fragments. All three examples were shank ends with a groove for the attachment of a line. The most nearly whole would have been at least 3.0 cm in length and width. This specimen had a grooved shank 1.8 cm wide, and measured 1.0 cm in width along the curved body. The grain of the bone ran perpendicular to the groove on the shank. The other fragments look similar in style and slightly smaller in size.

All fall within Gifford's category X. Similar circular hooks of bone have been found at Burton Mound (Harrington. 1928), Carpinteria, Dos Pueblos, and Santa Cruz Island (Heizer, 1949).

2. Straight, bipointed — 6 examples. These six articles, of the kind variously called fish gorges, barbs, bipointed hooks, or composite fishhooks, conform to Gifford's category U2. They are curved or double-curved asymmetrical objects, pointed at the distal end and tapered more bluntly at the base. They resemble most closely a specimen illustrated from San Miguel Island (Heye, 1921: Fig. 11c).

The four unbroken examples range from 4.0 to 5.7 cm in length. All are flattened and present a nearly rectangular cross section. Three of the four bear traces of asphaltum; on one of these, the asphaltum is present around the middle of the artifact, rather than at the butt, and impressions of cord wrapping are visible. All of the group are well ground and smoothly finished.

The straight fishhook is considered to be an earlier variety than the circular form, although in most areas it continued in co-existence after the circular form became preferred (Olson, 1930). The straight hook has been found in the Early Mainland period in association with milling stones, whereas the circular forms, more commonly of shell than either bone or stone, presumably arose in the Intermediate Mainland period in the mortar and pestle complex. The change is one of the few cultural developments which can be traced in this area. As between the use of bone or shell for the circular hooks, there is yet no evidence that one precedes the other in time (Heizer, 1949).

Beads

Objects likely to be beads or ornaments of bone numbered 13, of which seven were made of fish vertebrae and six of hollow bird bone.

1. Fish vertebrae — 7 examples. Among the tens of thousands of fish vertebrae examined, seven were considered to be beads because of extensive grinding around the periphery. In all cases, the cellular architecture of the bone was revealed and the edges smoothly polished. Four specimens had central perforations which were ground and large in proportion to the total size, the hole being ⅓ to ½ as great in diameter as the overall diameter. The holes on two other examples, group b. below, were either punched or natural, and were much smaller. The last and smallest specimen, group c., had a tiny pin-hole only, which may have been natural, erosional, or the beginning of a drilled perforation.

a. Drilled perforations — 4 examples. Gifford calls similar objects spools, and suggests that they are less likely to be beads but rather may be intended for the ring-and-pin game. Three of the examples have been identified as vertebrae of the Mako or bonito shark, *Isurus oxyrinchus*.

Diameter:	0.8-2.1 cm
Thick.:	0.5-0.7 cm
Diam. of hole:	0.3-0.9 cm

b. Punched or natural holes — 2 examples. One of these is a complete centrum of *Isurus oxyrinchus*.

Diameter:	1.7 and 3.0 cm
Thick.:	0.7 and 1.1 cm
Diam. of hole:	0.4 and 0.3 cm

c. Rudimentary hole — 1 example. This specimen is 0.7 cm in diameter, with a thickness of 0.5 cm.

2. Hollow tubes — 6 examples. Six tubes of unidentified bird bone have ends which have been cut and subsequently ground smooth. They conform to Gifford's EE1a, and he proposes the following uses: beads for stringing, gaming pieces, nose or ear sticks, drinking tubes, blanks for whistles, and mouthpieces for tobacco pipes. All but one are whole. The exception is broken off at one end and measures 2.9 cm in present length.

Length:	1.3-6.2 cm	Average: 3.5 cm (5 ex.)
Diam.:	0.2-0.5 cm	Average: 0.3 cm (6 ex.)

Object of Swordfish Bill

One interesting implement was made from the sword of the Broadbill swordfish, *Xiphias gladius*. The artifact was found in the bank at a depth of approximately 20 cm, somewhat east and south of the main excavation area (23 m east and 11 m south of datum).

The tool is 42 cm long and 8.4 cm in greatest width. The proximal end is cut away for a distance of 7.0 cm to form a tapering handle 3.0 cm wide. The distal end has been shaped into a broad convex point. This tip has been burned, and shows wear. It is possible that the tool has been used for digging.

A search of the literature does not reveal any counterparts. An object of the same material was found at Goleta which appears to be the same general shape, but the author found no human modification (McKusick, *et al.*, 1961). Gifford describes a swordfish bill which has a groove at the base rather than a handle, but his implement has a large central perforation and appears designed for a different use (Y, 178 and 224). Rogers has suggested (1929) that for the Santa Barbara Canalino, at least, the swordfish was held in great veneration and may have ceremonial implications.

Object of Turtle Shell

One fragment of worked turtle shell was recovered. It is a piece of plastron or carapace which is broken along the suture lines, and now measures 2.5 by 2.7 cm. The fragment has one biconically drilled perforation 0.4 cm in diameter. It was found in the 30-40 cm level.

The artifact resembles Gifford's R, presumably used as rattles. Unbroken specimens from San Miguel and San Clemente Islands have many perforations; small pebbles were placed between two shells, and the halves fastened together with asphaltum (Heye, 1921). Orr illustrates one from Mescalitan Island with a single perforation (1956).

OTHER ABORIGINAL REMAINS

Asphaltum

Asphaltum was abundant throughout the midden. Of the pieces which bore clear evidence of human utilization, there were two plugs, eight shaped pellets, 21 basketry impressions, and 56 tarring pebbles. In addition, there were innumerable amorphous lumps and cakes of various shapes and sizes, some encrusted with bits of wood, shell, twigs, stone flakes, pebbles, and other midden material. Not all was saved and recorded, but the weight of such clots placed in the level bags was well in excess of 2,000 g.

1. Plugs — 2 examples. The larger is shaped like a rivet with an expanded head at one end and a straight shank. The material is dense, smooth, and well compacted. This specimen is 1.4 cm long and 0.7 cm in diameter. The second plug has an expanded head at both ends and is constricted in the middle. It measures 0.9 cm in length, 0.5 cm in diameter on the shank, and 0.6 cm in diameter at either end. Both are fairly round in cross section.

These examples seem unduly small and fragile for use in plank canoes, and yet they are too long for stopping siphon holes in abalone shell dishes. The Spanish explorers have described wooden bowls and boxes, and perhaps plugs this size might have been used for such carpentry.

2. Pellets — 8 examples. These are varied in shape, but all have been worked and compacted between the fingers. They may represent residual pieces from some mending operation or convenient shop forms for future use. Two are symmetrical, one an egg-shape and the other a flattened egg-shape. Both are 1.6 cm long and 1.2 cm wide; the flatter one is 0.8 cm thick. The others are of random size and shape, from 0.8 to 1.9 cm long, and from 0.8 to 1.4 cm wide. They are about the size of skirt weights, but show no holes, impressions, or the pinched form characteristic of this artifact.

3. Basketry impressions — 21 examples. These specimens were examined and latex molds made

and analyzed by Dr. Charles Rozaire. With one exception, he found the weave to be plain 2-element Z-twining, i.e., two elements were used with the lean of the stitch down to the right. The fragment of different twined weave shows a lean of the stitch up to the right. One fragment (Cat. 536) shows a much longer span of the weft; conceivably this might represent the neck portion of a water bottle. There is otherwise an average of 8 warps and 15 wefts per 50 mm.

The largest fragment measures 10.0 by 7.0 cm. It is likely that all the vessels reflected in these impressions were water bottles, not only because of the use of asphaltum, but because the plain twined weave with slant of twining down to the right is most typical of this form. The most likely materials are tule rush, *Scirpus lacustris*, or whole *Juncus* stems for the multiple warps (Dawson and Deetz, 1964).

4. Tarring pebbles — 56 examples. Found throughout the site, and at all levels of excavation, were pebbles or small cobbles coated all over with asphaltum. Most of them were round to ovoid, utilized as they were found in nature, but 19 of the group had rough edges as though larger stones were broken in half before use. The broken specimens tended to be larger, which supports the idea that they were deliberately split to make them an appropriate size and weight.

Length:	2.4-6.8 cm	Average: 4.6 cm
Width:	2.0-6.1 cm	Average: 3.8 cm
Thick.:	1.4-5.2 cm	Average: 3.1 cm
Weight:	9-256 g	Average: 83.2 g

Pottery

The site is distinguished among coastal Chumash settlements by the recovery of not one — but 31 fragments of pottery. Like other groups of artifacts, the collection is thoroughly heterogeneous, differing greatly in color, thickness, temper, surface finish, apparent vessel size, and probably in cultural affinity as well.

1. Reddish, very thick — 7 fragments. The colors of these pieces are mostly Munsell 2.5 YR 5/6 or slightly variant. The two largest fragments measure 5.7 by 5.3 cm and 6.9 by 2.4 cm. All range from 1.0 to 1.5 cm in thickness. One piece is broken through a round perforation of the sort usually made for suspension of a vessel; the hole would be 1.2 cm in diameter. One of the larger fragments is a rim; this sherd tapers in thickness from 0.5 cm at the rim to 1.5 cm at the break, which is 5.3 cm down from the rim. The rim is straight. Three of the fragments have dark gray cores. All have very coarse sand temper, with some visible particles as large as 0.4 cm. Three are blackened on the exterior. Two show coiling clearly, and one of these is smoothly polished inside and out. The vessels represented may have been very large ollas, as made in many Missions.

2. Reddish-brown — 3 fragments. These pieces are more brown than the above, Munsell readings 2.5 YR 3/4 to 5 YR 5/4. They are also thinner, ranging from 0.5 to 0.8 cm in thickness. All have black cores with fine to medium temper. The largest piece, 6.0 by 4.5 cm, has a rounded, everted rim slightly thicker than the body wall; the vessel was probably a globular pot with flared rim. Two of the sherds seem to have a thin slip on both interior and exterior; the third is slipped on the inside but burned black on the outside. Two are visibly coiled, and all have some polish.

3. Brown — 7 fragments. The Munsell color ratings range from 5.5 YR 6/4 to 5 YR 4/2. All but one have a black core. The temper is medium sand, with some sparkle visible on the surface of six sherds. The thickness varies from 0.6 to 0.8 cm, but none of the fragments is large enough to suggest original shape. There is one rounded rim. Two have some polish.

4. Black — 2 fragments. These pieces appear black although they read N 3/0 (very dark gray) on the Munsell scale. The temper is fine to medium sand, with some sparkle on the surface. The thickness of both is 0.6 cm. No coils are visible. One fragment is very glossy on the interior.

5. Reddish-brown with fillet rim — 2 fragments. These sherds are 2.5 YR 5/4 on the interior, darker and burned on the exterior, and have a black core with coarse sand temper. The more complete piece has a fillet border 1.7 cm wide with a tapered, rounded rim. The other lacks the rim edge but has a similar border. The margin of the fillet on the body wall is very irregular. Coil marks are visible, although there is some smoothing and polish.

6. Red, thin — 1 example. This small fragment is 2.5 YR 5/6 in color clear through, with medium sand temper. It is 0.4 cm thick, and slightly S-curved, suggesting a position on the body wall at the base of the neck. The exterior is polished.

7. Reddish-yellow to reddish-brown, thick — 6 fragments. These are small sherds of a very coarse ware, with sand inclusions in excess of 0.3 cm long. Three have a black core, two have surface color clear through, and one is red on the interior and

black outside. They range from 0.8 to 1.2 cm in thickness, shapes indeterminable. At least two are visibly coiled.

8. Reddish-yellow to yellow-brown, glazed — 3 fragments. These examples are 7.5 YR 7/6 to 5 YR 5/4 in exterior color with a shiny glaze on the interior which reads 5 YR 7/8 to 5 YR 4/9. Two pieces are thick, 0.6 and 0.7 cm, and the third is thinner, 0.4 cm. The thin sherd and at least one of the thick pieces are clearly wheel-made. One is a rounded rim fragment, with the glaze spilling over onto the exterior for a distance of 0.6 cm. The temper of the thick pieces includes coarse black and white sands, and what seem to be red ceramic particles. The ware appears Mexican.

Quartz Crystals

Five quartz crystals were recovered, one of them double-terminated, two single-terminated, and two nodular. None bore any traces of asphaltum. The double-terminated specimen shows a trace of abrasion at one end, although it is not possible to determine whether this is from use or erosion. Both single-terminated crystals have the same condition on the tip opposed the terminated end. One of the non-terminated examples similarly shows some abrasion at one end.

Length:	0.6-2.3 cm
Diam.:	0.3-1.2 cm

Pigments

Small lumps and nodules of hematite were abundant throughout the midden, although none appeared to be molded, shaped, or cut as were specimens from Dos Pueblos and La Patera (Wheeler, 1879), and Burton Mound (Harrington, 1928). The lumps were mostly between one and three centimeters in size. Two nodules of limonite were recovered, both 2 cm long.

Concretion Cup

One concretion cup was examined in a private collection. Although the owner has cleaned the interior, he reported that when found, the specimen was filled with yellow pigment, and traces of limonite are still visible. The formation is natural and unmodified. It is 6.0 cm in diameter and 2.8 cm high, with walls 1.5 cm thick. Similar cups with pigment stains are known from Burton Mound (Harrington, 1928).

NON-ABORIGINAL ARTIFACTS

Trade Beads

Careful screening and meticulous sorting contributed to the recovery of 143 non-aboriginal trade beads, some as small as 2 mm, in a wide variety of color, shape, and size. They are grouped primarily by color, with some description of size and shape. Most abundant were blue beads, followed in order of frequency by red and white, yellow, and green. At Burton Mound the order was red, blue, green, and white (Harrington, 1928), and at Arroyo Sequit, blues and green constituted 213 out of the total collection of 216 (Curtis, 1959).

1. White or colorless — 16 examples.

a. White, opaque, globular to short barrel, irregular — 8 examples. Diameters range from 0.2-0.6 cm; thickness 0.2-0.25 cm. Seven have pin-hole perforations of 0.1 cm. One crude specimen 0.5 cm in diameter has a large hole of 0.25 cm; this bead is misshapen, and was apparently tumbled in a barrel while hot.

b. Clear, milky, translucent — 5 examples. Two are globular to short barrel in shape with diameter of 0.4 cm and hole of 0.1 cm. One is tubular with irregular ends, 0.6 cm in diameter, 0.7 cm long, with perforation of 0.2 cm. One is a flat, misshapen disk 0.5 cm in diameter, 0.2 cm in thickness, with 0.1 cm hole. The smallest specimen is globular and faceted, measuring 0.2 cm in diameter with 0.1 cm hole.

c. White, opaque, tubular — 1 example. This is a short, hexagonal bead in a private collection, estimated at 0.3 cm long.

d. Transparent glass — 1 example (modern ?). The bead is a round, flat, faceted disk, drilled through the flat plane. It is 1.8 cm in diameter, 0.7 cm thick, with perforation of 0.15 cm.

e. Pearl — 1 example (modern ?). This is a globular bead, 0.3 cm in diameter with 0.1 cm hole. It has a thin, eroded nacracous coating.

2. Red — 16 examples.

a. Dark red, opaque, globular — 1 example. Diameter is 0.3 cm, with hole of 0.15 cm.

b. Bright red, opaque, globular, faceted all over — 2 examples. These beads have diameters of 0.5 and 0.55 cm, with perforations of 0.1 cm.

c. Bright red, transparent, globular, faceted all over — 1 example. The specimen is 0.4 cm in diameter and has a hole of 0.1 cm.

d. Bright red, opaque, barrel shape — 3 examples. Two beads are 0.2 cm in diameter and 0.3 cm long. The other is 0.7 cm in diameter, with length of 0.9 cm and hole of 0.35 cm.

e. Bright red, transparent, straight tubular — 2 examples. Both are 0.2 cm in diameter, 0.7 cm long, with holes of 0.1 cm.

f. Bright red, translucent, tubular, rectangular cross section — 1 example. The bead is misshapen and eroded, but may have had an opaque white core. It is asymmetrical, with one corner drawn out. It has a length of 0.4 cm, diameter of 0.35 cm, and hole of 0.15 cm.

g. Brick red, opaque surface over translucent core, short tubular to barrel shape — 6 examples. Diameters range from 0.3 to 0.45 cm, and the beads are 0.25 to 0.4 cm long. All holes are 0.1 cm. On casual inspection, the cores appear black and heavily iridescent, but are yellowish when held up before a light. These seem to be the early type of Cornaline d'Aleppo beads typical of 17th and 18th century sites (Woodward, 1965). Similar examples, called "coralline d'Aleppo" were found at Dos Pueblos and were "omnipresent" at Burton Mound (Harrington, 1928).

3. Pink — 1 example. Although now eroded, the bead was probably transparent. It is a short tubular shape, with ends cut at an angle and rounded by tumbling. It measures 0.4 cm in diameter, 0.25 cm in length, with hole of 0.1 cm.

4. Yellow — 10 examples.

a. Opaque, short barrel — 8 examples. They range in diameter from 0.2 to 0.35 cm; in length from 0.15 to 0.35 cm; all holes are 0.1 cm.

b. Opaque, tubular — 1 example. This specimen has a diameter of 0.3 cm, length of 0.4 cm, and hole of 0.1 cm. The sides are straight and parallel, but the ends are very unevenly cut or broken.

c. Transparent, globular — 1 example. The bead is 0.5 cm in diameter and has a perforation of 0.1 cm.

5. Green — 5 examples.

a. Opaque, flattish — 2 examples. These have diameters of 0.25 cm, thickness of 0.15 cm, and holes of 0.1 cm.

b. Translucent, short tubular — 3 examples. Two of the beads are 0.3 cm in diameter, 0.3 cm in thickness, with holes of 0.1 cm. The other is larger, measuring 0.4 cm across, 0.3 cm in thickness, with perforation of 0.2 cm. All have a blue iridescence.

6. Blue — 81 examples.

a. Very pale blue, opaque, short tubular — 1 example. The bead is 0.25 cm in diameter, 0.2 cm long, with 0.1 cm hole. The ends are very irregular.

b. Pale blue, opaque, globular — 1 example. The specimen is 0.4 cm in diameter and has a 0.1 cm perforation.

c. Robin's egg blue (blue-green, sometimes called Venetian glass) — 37 examples.

(1) Opaque, globular — 1 example. The bead is 0.4 cm in diameter and has a 0.15 cm hole.

(2) Opaque, globular, glassy, faceted all over — 1 example. The specimen measures 0.5 cm in diameter. The hole is 0.15 cm, with a metal object firmly embedded through it.

(3) Translucent, short barrel shape — 19 examples. The beads range in diameter from 0.3 to 0.4 cm, and in length from 0.2 to 0.4 cm. The holes are 0.1-0.2 cm.

(4) Translucent, short tubular — 16 examples. This group has straight, parallel sides with uneven ends. The diameters are 0.2-0.4 cm; lengths are the same range. All perforations are 0.1 cm.

d. Dark blue, translucent, patinated, iridescent — 38 examples. This is an amorphous group, from barrel to tubular in shape, with very irregular ends and several misshapen specimens.

(1) Small — 36 examples. Distinction cannot always be made between tubular and short barrel categories because of both tumbling and sand erosion. Diameters range from 0.12-0.5 cm; lengths from 0.2-0.4 cm; and holes from 0.1-0.2 cm.

(2) Small, flattish — 1 example. This bead is 0.25 cm wide, 0.15 cm thick, and has a perforation of 0.1 cm.

(3) Large, barrel shape — 1 example. This specimen is 0.6 cm in greatest diameter, with a length of 0.8 cm, and hole of 0.2 cm.

e. Very dark blue, translucent, over white opaque core — 1 example. This is a large bead of short barrel shape. The interior of the large hole appears to have been lined with an opaque white substance, although this is now much eroded away. The bead is 1.15 cm in diameter, 0.9 cm long, with a perforation of 0.5 cm.

f. Bright blue over pale blue core, both translucent — 1 example. The bead is tubular and hexagonal, with one facet at either end of each intersecting plane to create a pseudo-effect of multiple faceting. It is 0.5 cm in both diameter and length, with perforation of 0.25 cm. The outer wall of the darker blue is about 0.1 cm thick and seems built up of concentric layers; the lighter blue core is less than half as thick.

7. Lavender — 1 example. This specimen is barrel shape, opaque, with air bubbles visible in the smooth, glassy surface (modern ?). It may have had an opaque white lining. The diameter is 0.6 cm, length 1.3 cm, and hole 0.15 cm.

8. Black — 12 examples.

a. Very heavily patinated and iridescent, original surface and color (if any) lost — 6 examples.

(1) Globular to short barrel shapes — 5 examples. Two of these have a bluish irideseence, and one is more green. At least one is translucent. All are irregular and misshapen. Diameters are 0.3-0.5 em; lengths are 0.25-0.3 em; holes are 0.1-0.2 cm.

(2) Tubular — 1 example. The irideseenee favors the blue speetrum. The ends are eut at an angle and irregular. The diameter is 0.3 cm, length is 0.4 em, and perforation is 0.1 em.

b. Shiny, opaque, globular, faceted all over — 2 examples. One of the beads measures 0.4 em in diameter and length, with a single hole of 0.1 em. The other is 1.3 em in diameter, and 1.0 em in length; this has one hole entering the bead, joining two holes eoming out on the opposite side, all with 0.35 em bore. It resembles beads used at the juneture of a rosary.

e. Dull, opaque, globular, soft material — 4 examples. The substanee is unknown, but may be fired clay; it can be seratched with a knife and powders easily. All have tiny pin-holes whieh are not drilled. Three measure 0.8, 0.9, and 0.9 cm in diameter. The fourth is larger, 1.2 em, and is impressed on four sides with a pattern of 12 rays in the center with six or more rays arranged eoneentrieally outside them.

9. Metallie — 1 example. This is a globular bead with a thin and blistered copper-colored skin over a translucent glass eore. The diameter is 0.6 em, length is 0.5 cm, and hole is 0.1 em.

10. Faney, bieolored — 1 example. The speeimen is globular with eopper-colored stripes through an opaleseent, translueent core whieh has a purplish east. The stripes run around the "equator" of the bead in more or less parallel lines, shading from thiek (one end at the perforation is eopper) to thin (the other end is the pale eore). The bead is 1.0 em in diameter, 0.9 cm long, and has a hole of 0.3 em.

Tile

Eight fragments presumed to be Mission tile and one pieee of glazed, deeorated tile were found.

Of the Mission group, six pieces are orange-red in color (Munsell 5 YR 5/8), one with core of 5 YR 2/2. Two are more reddish, 2.5 YR 5/8. The largest piece is 5.8 by 5.5 cm, with a thickness in excess of 4.6 cm. This one has one nearly flat surface, as if it was a floor tile, and one flat edge at a right angle. This fragment is particularly coarse, with grit larger than 0.3 cm and particles of shell included.

Four of the fragments have some curvature and may represent roof tiles. The largest of these measures 7.0 by 5.0 cm, and thicknesses of the three specimens which have two finished sides present are 1.5, 1.7, and 2.1 cm. One fragment, although small, appears flat on both opposed surfaees. This is only 2.7 by 1.9 em, with thickness of 1.5 em, and certainly could be roof tile.

The other two pieees are shapeless fragments whieh do not reveal any clue to the original shape.

The sole piece of decorated tile has a brick-eolored base, with a painted design in red, white, and blue under glaze. The pattern is curvilinear.

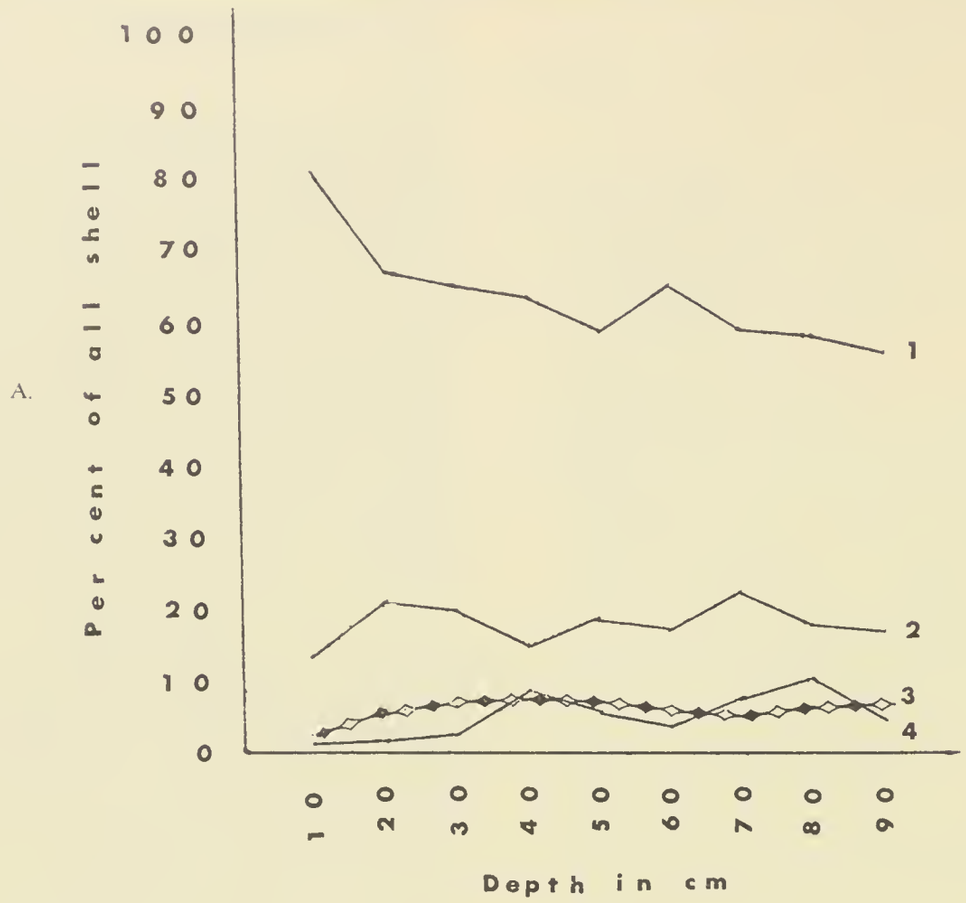
Miseellaneous

Other non-aboriginal items inelude 76 fragments of eroekery, 605 pieces of glass, 327 cut nails ranging in length from 1.0 to 14.5 cm, 153 other metals, six eartridges, four buttons, and other sundry items deseribed below. Some of this material is demonstrably old, though most of the metals are eorroded beyond identifieation.

Among the more unusual items was a seemingly antique hand-made marble. It bore a faded hand-painted design of one green stripe interseeting one red stripe over the glaze on an opaque white baekground. One 1912 United States nickel was found, and a earbon arc from an old-time street lighting fixture.

One of the most puzzling speeimens was a perforated, hand-shaped lead objeet most resembling a erude tubular bead. This is 3.7 cm long, 1.3 em in diameter at the ends, and 1.8 em in diameter at the middle. It weighs 57 g and is heavily patinated. Jose Longinos Martinez reported in 1792 that the Indians did know of galena deposits near San Gabriel Canyon and on Catalina Island, at least by the Mission period (Simpson, 1961). The item might thus be aboriginal, a re-use of historie lead, or a partieularly erude line or net sinker.

One fragment of white ironstone ehina showed a portion of a maker's mark whieh might be that of the East End Pottery Co. (Ohio), Tunstall in Great Britain, the Wheeling Pottery Co. (West Va.), or the Steubenville Pottery Co. (Ohio); all these firms were aetive in the fourth quarter of the nineteenth eentury (Kovel, 1953). A piece of glass which has beeome purple and iridescent seems to be the rim of an early milk bottle with hand laid-on lip. The exterior diameter of the rim is 5.5 cm; the thickness of the glass at the lip is 1.2 em, and on the body wall of the neck, 0.8 cm. Such a bottle probably dates before 1914.



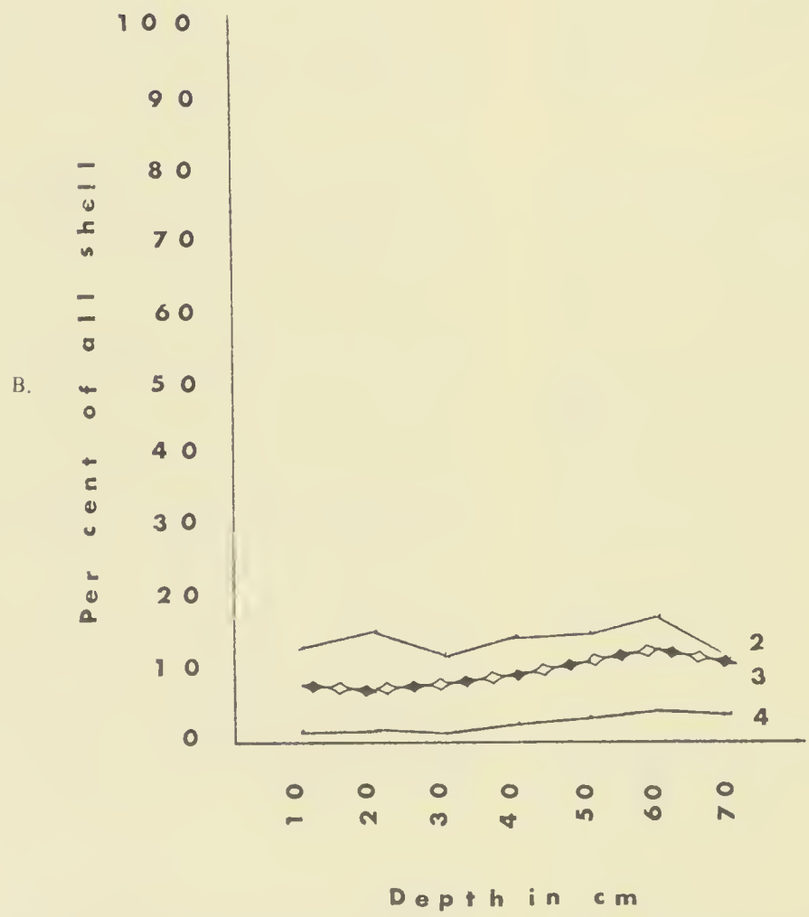


Figure 11. Distribution of major shells. A. Pit E 11 — S 4, identified to ¼ inch; total shell weight 49,654 g B. Pit W 11 — S 6, identified to ⅛ inch; total shell weight 46,897 g 1. *Protothaca staminea*; 2. *Tivela stultorum*; 3. *Tegula funebralis*; 4. *Donax gouldii*.

The metals included segments of iron pipe, ornamental cast iron, and strap iron. Hardware included a variety of square cut and round wire nails, a foot-long square-headed, gimlet-pointed lag screw, square and hexagonal-headed bolts, iron wing nuts, and copper tubing and rivets. The projectiles included a 12 gauge shot gun shell made by Union Metallic Cartridge Co. between 1867 and 1910, .22 calibre short and long (Super X and Winchester) cartridges, and lead B. B. shot.

One piece of silver jewelry was a crudely stamped or cut bead or pendant of lunate shape with one perforation at each end. The piece is 3.1 cm long, 1.0 cm wide at the middle, and 0.7 mm thick.

None of the Caucasian remains was traceable to the Mission period, except for the trade beads and tile. The other historic objects represent an inventory to be expected in recent trash fill.

MIDDEN ANALYSIS

The dampness of the soil and the lack of running water on the site contributed to a more thorough analysis of the components than might have been performed under more optimum working conditions. The two control pits were subjected to total analysis as planned, with weights tabulated for waste flakes, unmodified stone by material and size, charcoal, asphaltum, and ochre, in addition to shell by species, and bone. Since all matter left in the screens from the other pits also had to be moved to a laboratory for washing before it could be sorted, it, too, was broken down into shell and bone components in addition to picking out the artifacts. All shell from the ¼ inch screens from two of the regular pits in the center of the site was identified and tabulated for two purposes: to check against the distributions from the two control pits, which were on the east and west peripheries of the site, and to compare the results obtained from the ⅛ inch against the ¼ inch screens.

Shell

From all the data, a consistent picture emerges of the shellfish diet. In all pits and at all depths, a remarkably constant distribution prevailed: *Protothaca staminea* constituted about 60 per cent of all shell, *Tivela stultorum* about 18 per cent, *Tegula funebralis* and *Donax gouldii* contributed about 7 per cent each, and the balance was accounted for by a very wide variety of other specimens of which some were edible and others adventitious (Figure 11). Of the 66 species identified, 37 were found in the control pits, while 29 additional varieties were added only because the shell in other pits was also sorted (Table 11). Although the supplementary list was present in small quantities and could not have been of much importance in the diet, it nevertheless contributes information about the total ecology and suggests that small samples and overreliance on a few control units may present certain hazards, especially when such control pits are peripheral.

The shell distribution at Ven-3 is seen to differ markedly from the array at other sites. At Arroyo Sequit, the midden contained about 2/3 mussel (Curtis, 1963), while at Goleta, the two cockles accounted for almost 60 per cent of the shell, followed by the littleneck clam with 23 per cent and oyster at 11 per cent (McKusick, *et al.*, 1961). The difference is more likely based upon different beach and water conditions than upon cultural preferences. The *Chione* at Goleta were found in a slough or lagoon; their absence from Ventura suggests that the habitat during Indian occupation was much as it is today — an exposed outer coast. The shore line in the immediate vicinity is comparatively free of rock, and consequently not a favoring environment for either mussel or abalone. The Pismo clams in the deposit consistently averaged only two to three inches, undersized according to current standards. The young of the species grow in the intertidal zone, whereas the larger adults live in 10 to 25 feet of water off the beach, so the small size of the shells implies that the Indians were harvesting primarily the intertidal, rather than that the supply was depleted. Comparisons of shellfish consumption between sites can be misleading if differences are ascribed to cultural choices alone without consideration of water, shore, and bottom conditions.

Comparison of the distributions obtained in the control pits by identification of all shell down to ⅛ inch with those from the regular pits, where only shell in the ¼ inch screen was identified, demonstrates that for this site, use of the ¼ inch mesh for shell analysis would be sufficient (Figure 11). This would not be true, however, in other sites where mussel predominates since this shell is so much more fragile. The same chart, comparing distributions from the eastern and western areas of the site, proves that there were neither horizontal nor vertical stratigraphic differences in use of different molluscs at a level of statistical significance.

The total recovery of 1,027,500 g of shell from 24 m^3 of midden equals an average of 42,812.5 g/m^3. This exceeds, sometimes very greatly, the shell content of all other sites for which comparable figures could be computed with the sole exception of San Miguel Island (Table 3). The chart should be viewed with caution and reservations, as explained in the notes. It is unfortunate that methods of sampling and reporting have varied so greatly that results are not always comparable.

TABLE 3

Comparison of Shell and Bone Content at Seven Sites

Grams per cubic meter

	San Miguel Island	*Cata-lina Island*	*San Nicolas Island*		*Arroyo Sequit*	*Goleta*	*Ven-3*
			a.	*b.*			
Shell	140,083	297	59	2	—	12	42,813
Bone	420	8	—	—	283	0.1	609
Data	(1)	(2)	(3)	(4)	(5)	(6)	(7)

[1]Computed on the basis of three microanalysis pits (Curtis, personal communication).
[2]Little Harbor Site (Reinman, 1964). Considered early.
[3]SNI-16. (Reinman, 1964). Considered early.
[4]SNI-79 (Reinman, 1964). Considered late.
[5]Computed from one pit; shell statistics not applicable (Curtis, 1963).
[6]Computed from four control columns for bone; one level of one pit for shell (McKusick, *et al.*, 1961).
[7]Figured from total site recovery.

Shell statistics based on percentages of a midden sample measured by weight alone cannot be used in comparing weight per cubic unit because such samples will vary greatly in volume according to the amounts of heavy rock, light bone, or other differential components. It would seem that the amount of shell (and bone) per any given cubic measure of volume is a very important fact when assaying the total food resources of an aboriginal occupation, the changes within any one site, and comparisons between sites, and it is hoped that future investigations will include such data.

The oysters on the shell list are not the native *Ostrea lurida*. They may be *Crassostrea virginica* brought here by early ships or traded in, or they might be one of the Gulf of California oysters. Several broken pieces of *Mytilus* were from a much larger species of mussel than is found off the local coast today; they are, in fact, thicker than any known species.

Bone

A total of 14,605 g of bone was recovered from the 24 m^3 of midden, for an average of 608.5 g/m^3. This is well in excess of all other sites for which a tentative average could be computed (Table 3). There was no difference in proportion between the ratios of shell and bone accumulated at the various levels of the excavation (Table 4). In other words, the inhabitants seemed to place the same reliance on vertebrates and molluscs throughout their occupation of Ven-3, and no shifts in subsistence pattern can be demonstrated. The vertical distribution of food remains also correlates well with the levels of aboriginal artifacts.

Preliminary inspection of the mammal bone suggests that there is a wide variety of fauna represented. Sea mammal seems to predominate, with specimens tentatively identified as whale, seal, and sea lion. Land mammals include deer, cotton-

TABLE 4

Proportions of Bone, Shell, and Artifacts by Levels

Depth in cm	*Grams of Bone*	*% of All bone*	*% of Art-ifacts**	*% of all Shell*	*Grams of Shell*
0-10	856	5.9	11.8	8.5	87,464
10-20	3,159	21.6	25.9	30.8	316,499
20-30	4,143	28.3	23.4	23.8	244,217
30-40	2,543	17.4	14.3	14.6	150,469
40-50	1,956	13.4	10.4	11.5	117,764
50-60	1,444	9.9	9.1	7.2	74,000
60-70	289	2.0	3.5	2.6	26,775
70-80	160	1.1	1.3	.8	8,400
80-90	55	.4	.2	.2	1,912
90-100	Trace	—	.1	—	Trace
Totals	14,605	100.0	100.0	100.0	1,027,500

*Aboriginal artifacts only, excluding all surface collections.

tail, rat, and squirrel, and undoubtedly others as well. The avian bone includes gull, pelican, and tracheal rings from duck or other water birds.

The following fish have been identified so far by teeth, pharyngeals, scutes, or spines:

Myliobatis californicus	bat ray
Isurus oxyrinchus	mako
Notorynchus maculatus	sevengill shark
Galeorhinus zyopterus	soupfin shark
Squatina californica	angel shark
Hexanchus griseum	sixgill shark
Triakis semifasciata	leopard shark
Cephaloscyllium ventriosum	California swell shark
Heterodontus francisci	California horn shark
Platyrhinoidis triseriata	California thornback
Mustelus californicus	gray smoothhound
Squalus acanthias	dogfish
Amphistichus argenteus	barred surfperch
Pimelometopon pulchrum	sheep-head
Xiphias gladius	swordfish
Trachurus symmetricus	jack mackeral
Raja binoculata	big skate
Raja inornata	California skate
Rhinobatos productus	shovelnose guitarfish
Sarda chiliensis	bonito
Scomberomorus concolor	Monterey Spanish mackeral

Since the identification of fish vertebrae and other bony remains has not yet been performed, it is anticipated that the total list of species will be long, but that the white croaker will be confirmed as the predominant catch.

Certain of the bony remains not classified as artifacts may have served some useful purpose. For instance, Heye (1921) has suggested that the dental plates of the bat ray could have been used as files or rasps for smoothing objects of bone, shell, or wood, or for producing incised designs on abalone shell items.

Many of the small fragments of bone are dark from permineralization, which can occur in soils of pH 8 within a few hundred years, given the rainfall pattern of the Ventura coast.

It will be of great interest and importance to see how the results of the otolith study correlate with the identification of bone to be undertaken by W. I. Follett. Fish bone does not preserve well, is fragile to handle, and difficult to identify. If the otolith research compares well with the more conventional bone analysis — and it is anticipated that it will — then this may well become the preferred technique for the future. The methods, implications, and conclusions of this significant study are presented in Appendix A. To recover otoliths, it is necessary to employ finer screens than archaeologists usually use. Practically none whatever were found in the ¼ inch screens. The ⅛ inch sieve caught the otoliths of croaker, bass, barracuda, and other middle-sized fish, but did not adequately reflect the smaller surf varieties which were certainly eaten. It took a 0.5 mm mesh (32 mesh per inch) to retain the smaller otoliths and certain teeth.

Most of the otoliths are from adult specimens, suggesting that the fish were caught on fairly large hooks and not beach seined or trapped. None of the otoliths was modified, although a necklace of white seabass otoliths interspersed with *Olivella* shells was found on San Nicolas Island (Los Angeles County Museum of Natural History, Cat. no. A 5600/99), and freshwater otoliths were used as ornaments by the Wisconsin Indians. Mr. Fitch examines this aspect in his own contribution, but there does not seem to be any indication of seasonality in the identifications. One of the most important implications of the study is that when the data from the otoliths are compared to the protein value of the shells recovered, it appears that the Indians were eating four times as much fish as molluscs.

Two whale vertebrae were recovered from the midden. One had a diameter of 25 cm and thickness of 18 cm; the other specimen was 26 cm in diameter and 21 cm in thickness. A fossilized whale humerus, well tumbled and polished in the surf, was a surface find probably Miocene in age.

Another fossil remain was a pecten found in the 40-50 cm level of the excavation. This was probably of the Santa Margarita formation and could have come from the Miocene outcrops throughout the area.

Plant Remains

Three burned seeds found in the deposit have been identified as *Arctostaphylos*, probably *A. glandulosa*. This is a manzanita common in the area which bears a red fruit. The fruit can be eaten raw, or may be dried, pounded into flour, and mixed with water to make a mush.

CONCLUSIONS

Other accounts have summarized well the history, culture, tools, and subsistence patterns of the Chumash (cf Landberg, 1965), so this kind of generalized information will not be repeated here. Rather, this section will summarize the specific results of the project with reference to Ven-3.

Reflection on the excavation results indicates that the sorting and identification of shell down to ⅛ inch did not add any data to the midden analysis because the proportion of mussel, the most fragile of the common food remains, was small. For this site, computations based on ¼ inch screenings would be significant. However, a shell study depending on the analysis of two control pits only would not have produced a full list of species present. The ⅛ inch screening was important, on the other hand, to provide an adequate representation of aboriginal beads, even more necessary to recover the trade beads and small fish vertebrae, and absolutely required if otoliths are to be sought. For a complete otolith analysis, processing soil through 30-mesh screen or finer is indicated.

The site proved demonstrably richer in yield of all classes of artifacts than Goleta, Arroyo Sequit, or most other Chumash sites. The difference is striking when one considers that what is left, and was studied, at Ventura is only the very margin of the occupied area. The coast at this point has lost at least 150 feet of land since 1868, and one authority has estimated that the shore line perhaps stood as much as one-fourth of a mile seaward 1,000 years ago (Norris, 1966). It is estimated that two-thirds of the midden has already been lost and with it, an abundance of archaeological resources which probably included house floors, hearths, and additional burials.

The evidence recovered substantiates the belief that this was a large, relatively permanent village, almost certainly a provincial capital of some importance and more than likely the settlement described by the Spanish explorers and named by them Pueblo de las Canoas. The discussion below will suggest that the duration of the occupation largely coincided with the years of Spanish exploration, probably beginning not too many centuries before Cabrillo's visit and not surviving too long after the beginning of the Mission Period.

The catalogue of stone artifacts reveals that the flaked tool assemblage considerably outnumbers the ground and polished stone totals. The simple cobble tools demonstrate once again the conservative survival of this early industry. The flaked tools are for the most part an undistinguished, unstandardized, and crudely fashioned assortment, often retaining both cortex and bulb of percussion, shaped with the minimum amount of workmanship necessary to produce the requisite working edge. Secondary utilization of artifacts is common, i.e., broken points and blades used for scraping, or exhausted cores and choppers used for pounding. A full tool kit is present, lacking only the prepared platform core and micro-drill industry reported at Goleta (McKusick, *et al.*, 1961). The latter site also seems to have a more specialized array of small scraper types, although all of the functions which they served could have been performed by the more generalized inventory of Ven-3. None of the very small drills suitable for making beads was found at Ventura, despite the large bead collection. Costanso reported that the mainlanders got their shell beads from the Islands (Heizer, 1955), although it may also be that they obtained either the beads or the tools from Goleta or some other area of specialized industry.

The broad triangular form of projectile points and blades is offered as one category which may be earlier than the slender triangular, concave base shape which predominated at this site. The tarring pebbles also seem to have a somewhat lower distribution in the midden, as they did at Soule Park (Susia, 1962). It is suggested that an arched triangular flake tool may have been used for extracting shellfish, and that an unmodified cobble bar implement survived from an earlier period to perform caulking and pounding duties.

The inventory of bone artifacts included a wide variety of objects but none of an exotic nature and none elaborately decorated, inlaid, or incised. Similarly, the items made of shell were diverse in design and material, and yet basically simple. A few of the shell disk beads bore traces of asphaltum as if they had been used for inlay, but no such articles were found. Aside from the ornaments of various materials, the only nonutilitarian items found were the quartz crystals (which may have been used for drilling), one bone wand or ceremonial item, a possible serpentine effigy, and a probable steatite canoe representation.

Perhaps the most novel finds at Ven-3 were the 31 fragments of aboriginal pottery. They, too, differ greatly in technique and presumed cultural origins. Final definition of their affinities must await more expert opinion, but it seems apparent that the various pieces were brought in from several sources. It is likely that the coastal location and seafaring habits of the population contributed to the pottery collection, and that perhaps some of the sherds represented breakage or abandonment on the beach of ceramics brought in by traders, explorers, and padres.

The stability of both artifacts and subsistence pattern argues for a large village occupied over a short span of years, rather than a small settlement of great age. Not only is the shell distribution among species constant, but the proportions between shell and bone remain unchanging for all depths of the midden. The use of both land and

TABLE 5

Distribution of Points and Blades

Category	Depth from surface in cm 0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	Surf.	Total
Proj. points											
1.	2	10	5	5	4	1	—	1	—	9	37
2.	—	—	—	—	—	2	—	—	1	2	5
3.	—	1	—	1	—	—	—	—	—	6	8
4.	—	—	—	—	—	—	—	—	—	2	2
5.	—	—	—	—	—	—	—	—	—	2	2
6.	—	—	—	—	1	—	—	—	—	—	1
7.	2	4	6	3	1	1	2	—	—	19	38
Totals	4	15	11	9	6	4	2	1	1	40	93
Blades											
1.	—	—	1	—	2	—	—	—	—	—	3
2.	—	—	—	1	—	—	—	—	—	—	1
3.	1	1	—	—	—	—	—	—	—	3	5
4.	—	—	—	—	—	—	—	—	—	6	6
5.	—	—	—	—	—	—	—	—	—	1	1
6.	—	2	1	2	—	—	—	—	—	3	8
Totals	1	3	2	3	2	0	0	0	0	13	24

TABLE 6

Distribution of Classified Flaked Tools

Depth from surface in cm

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*70-80*	*80-90*	*Surf.*	*Total*
Choppers											
1.	—	1	2	2	—	—	—	—	1	—	6
2.	—	1	—	—	1	—	—	—	—	1	3
Hammerstones											
1 a.	—	—	4	1	1	1	—	—	—	5	12
b.	—	2	4	3	—	—	—	—	—	5	14
2.	—	—	1	—	2	—	—	—	—	—	3
3.	—	—	2	—	—	—	—	—	—	—	2
Knives											
1.	5	—	—	4	2	—	—	1	—	1	13
2.	—	1	1	—	1	—	—	—	—	—	3
3.	—	1	1	2	—	—	—	—	—	1	5
4.	—	1	1	1	1	—	—	—	—	—	4
Drills											
1 a.	4	8	14	3	1	2	—	1	—	8	41
b.	1	9	5	2	—	—	—	1	—	7	25
c.	—	1	2	1	—	—	—	—	—	1	5
2.	—	2	2	—	1	—	1	—	—	3	9
Gravers	—	1	—	1	—	—	—	—	—	3	5
Pick	—	—	—	—	—	—	—	—	—	1	1
Small Scrapers											
Ovoid	1	1	1	—	—	—	—	—	—	3	6
Side	1	4	4	6	1	1	—	—	—	3	20
End	3	1	3	1	3	1	1	—	—	1	14
End and Side	—	2	4	4	—	3	—	—	—	3	16
Planes	1	2	1	2	—	—	—	—	—	—	6
Clam Pick	—	—	—	1	—	—	—	—	—	—	1
Used Cores	—	1	2	—	—	—	—	—	—	1	4
Used Flakes	2	—	1	3	2	1	—	—	1	—	10
Totals	18	39	55	37	16	9	2	3	2	47	228

TABLE 7

Distribution of Classified Ground and Polished Stone Artifacts

Depth in cm

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*Surf.*	*Total*
Pestles								
1 a.	1	—	—	—	—	—	2	3
1 b.	—	2	1	—	—	—	1	4
2.	—	1	—	4	—	—	5	10
Totals	1	3	1	4	0	0	8	17
Steatite								
1.	3	5	1	3	1	—	2	15
2.	2	1	1	1	—	—	2	7
3.	—	—	—	—	—	2	1	3
4.	—	1	—	—	—	—	—	1
Totals	5	7	2	4	1	2	5	26

TABLE 8

Distribution of Shell Beads

Depth in cm

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*70-80*	*80-90*	*Surf.*	*Total*
I A 1	3	11	7	15	10	4	1	—	—	26	77
2	47	66	54	23	20	10	4	1	—	149	374
3	218	548	430	244	190	193	68	21	—	467	2,379
4	11	22	30	12	10	13	3	1	—	26	128
5	—	2	5	2	2	—	1	—	—	14	26
B	4	4	12	16	5	6	1	1	—	1	50
C	14	28	23	24	11	12	5	2	—	24	143
D	—	—	—	—	—	2	—	—	—	1	3
											3,180
II A	6	12	5	4	1	2	1	—	—	5	36
B	35	59	73	39	33	16	8	3	—	13	279
C	—	—	—	—	—	—	—	—	—	1	1
D	—	—	—	—	—	1	—	—	—	—	1
											317
III A 1	—	1	—	—	—	—	—	—	—	—	1
2	1	3	2	—	—	—	1	—	—	—	7
3	10	12	14	11	16	9	6	1	2	6	87
B 1	—	—	—	—	2	—	—	—	—	—	2
2	—	2	2	2	—	1	—	—	—	—	7
											104
IV	12	10	5	3	2	3	—	—	—	—	35
V	2	4	3	4	1	2	1	2	1	5	25
VI	—	1	1	1	—	—	—	—	—	3	6
VII	—	1	1	—	—	—	—	—	—	1	3
VIII	—	—	—	1	—	—	—	1	—	—	2
IX	—	1	—	—	—	—	—	—	—	—	1
X	—	—	—	—	—	—	—	—	—	2	2
XI	—	—	—	—	1	—	—	—	—	—	1
XII	1	—	2	—	—	—	—	—	—	—	3
Totals	364	787	669	401	304	274	100	33	3	744	3,679

TABLE 9
Distribution of Shell Ornaments
Depth in cm

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*Surf.*	*Total*
1.	—	—	—	1	—	—	—	—	1
2.	—	—	—	—	—	—	1	—	1
3 a.	—	—	—	1	—	—	—	—	1
b.	—	—	1	—	—	—	—	1	2
4 a.	1	—	—	—	—	—	—	2	3
b.	—	—	—	1	—	—	—	—	1
c.	—	—	—	—	1	—	—	—	1
d.	—	—	—	—	—	—	—	1	1
e.	—	—	—	—	—	—	—	2	2
f.	1	—	—	—	—	—	—	—	1
g.	—	—	—	—	—	—	—	1	1
h.	—	—	—	1	—	—	—	—	1
i.	—	1	2	1	1	2	2	—	9
Totals	2	1	3	5	2	2	3	7	25

TABLE 10
Distribution of Classified Bone Tools
Depth in cm

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*70-80*	*Surf.*	*Total*
Awls										
Alal	—	—	—	—	—	—	—	1	—	1
Alb1	—	—	1	—	—	1	—	—	1	3
Alc	—	1	1	1	—	—	1	1	—	5
Ale	—	—	1	—	—	—	—	—	1	2
Alf	—	—	—	—	—	1	—	—	3	4
A4	—	—	—	—	—	1	—	—	2	3
A5a	—	—	—	—	—	—	—	—	1	1
Misc.	1	5	11	5	3	6	3	—	7	41
										60
Wedges	—	2	—	—	3	1	—	—	—	6
Gaming pcs.	1	2	—	—	1	—	—	—	—	4
Bipointed	—	—	—	—	1	1	1	—	—	3
Antler ob.	—	—	—	—	—	1	—	—	—	1
Splinters	—	1	2	1	1	—	—	—	1	6
Ceremonial	—	—	—	—	—	1	—	—	—	1
Bird Claw	—	1	—	—	—	—	—	—	—	1
Fishhooks										
1	—	—	—	—	—	—	—	—	3	3
2	—	—	3	—	1	1	—	—	1	6
Beads										
1	1	1	—	3	1	—	—	—	1	7
2	1	—	3	—	—	1	—	—	1	6

TABLE 11

List of Shell Species

Found in control pits	Found in other pits
Bivalves	**Bivalves**
Protothaca staminea	*Mactra californica*
Tivela stultorum	*Saxidomus nuttalli*
Donax gouldii	*Hinnites multirugosus*
Mytilus californianus	*Ostrea* sp.
Aequipecten circularis	*Semele decisa*
Septifer bifurcatus	*Clinocardium nuttalli*
Tresus nuttalli	*Chama* sp.
Trachycardium quadragenarium	*Penitella penita*
Macoma nasuta	*Chione californiensis*
Chione undatella	*Lima dehiscens*
Pododesmus cepio	*Megasurcula carpenteriana*
Pseudochama exogyra	*Mytilus* sp.
Univalves	**Univalves**
Tegula funebralis	*Crepidula lingulata*
Olivella biplicata	*Crepidula adunca*
Acanthina spirata	*Astraea undosa*
Ocenebra poulsoni	*Godinia reticulata*
Haliotis cracherodii	*Pseudomelatoma* sp.
Cypraea spadicea	*Acanthina punctulata*
Acmaea incessa	*Dendrapoma rastrum*
Acmaea asmi	*Diodora aspera*
Kelletia kelletii	*Acmaea gigantea*
Crepidula onyx	*Terebra danai*
Nassarius perpinguis	*Terebra (pedroana?)*
Conus californicus	*Fusinus kobelti*
Fissurella volcano	
Cerethidia californica	**Miscellaneous**
Forreria belcheri	*Strongylocentrotus purpuratus*
Polinices reclusianus	*Dentalium neohexagonum*
Littorina scutulata	*Dentalium semipolitum*
Shaskyus festivus	*Balanus nubilis*
Bittium purpureum	*Mopalia mucosa*
Mitrella carinata	
Opalia insulata	
Littorina planaxis	
Nassarius mendicus	
Miscellaneous	
Lepidochitona hartwegii	
Balanus tintinnabulum	

sea vertebrates for food appears greater than for other Chumash sites. The availability of land mammals in this north Channel coast, plus the teeming fish resources and shellfish supply and the juxtaposition of several vegetation zones would all help to sustain a large population with comparative ease.

All evidence points to a rather late dating for the occupation. The circular fishhooks, mortar and pestle, diversified array of shell objects, and concave based projectile points are all considered most typical of the Late Mainland period. The intensive exploitation of a few molluscan genera is also regarded as a late characteristic. The presence of the pottery and trade beads throughout the levels of most intense occupation confirms the belief that the village reached its climax not too long before the arrival of the first Spanish ship. Disregarding the surface collections, 98.9 per cent of all the historic objects were found in the top 40 cm, and 75.3 per cent of all aboriginal artifacts were also within that depth.

The diversity of the sherds and the wide variety of styles displayed in the other artifact groups perhaps attests to the cosmopolitan status of the village with a concomitant mixture of peoples and technologies. Yet, although the community stood between the climax areas of Santa Barbara and Malibu, it apparently did not participate in the artistic efflorescence of either. If this was indeed a provincial capital, as the early observers reported, its role may have been oriented to trade rather than to ceremonialism. It is considered that Shisholop originated during the Late Mainland cultural horizon, most likely after 1,000 A.D., flourished during the first years of Spanish exploration, declined rapidly by the early Mission Period, and never witnessed the days of the ranchos.

Literature Cited

Bailey, T. L., 1953. Geology of the Western Ventura Basin, Santa Barbara, Ventura, and Los Angeles Counties, Map Sheet No. 4. *Calif. Div. of Mines, Bull. 170.*

Bancroft, H. H., 1886. *History of California.* The History Co., New York, Vol. 1, 742 p.

Blackburn, T., 1963. A Manuscript Account of the Ventureno Chumash. *Archaeological Survey Annual Report 1962-1963.* Univ. of Calif., Los Angeles, p. 135-158.

Bolton, H. E., Editor, 1925. *Spanish Exploration in the Southwest 1542-1706.* C. Scribner's Sons, New York, 487 p.

Burnett, E. K., 1944. Inlaid Stone and Bone Artifacts from Southern California. *Contributions from the Museum of the American Indian,* Heye Foundation, New York, 13: 1-60.

Curtis, F., 1959. Arroyo Sequit. *Archaeological Survey Association of Southern California, Paper No. 4,* 169 p.

———. 1963. Arroyo Sequit: Archaeological Investigations in Leo Carrillo Beach State Park, Los Angeles County, California. *Calif. Div. of Beaches and Parks, Interpretive Services Section, Archaeological Report No. 9,* 121 p.

———. *Microanalysis — SMI-1.* [Unpublished manuscript].

Dawson, L. and J. Deetz, 1964. *Chumash Indian Art.* The Art Gallery, Univ. of Calif., Santa Barbara, 32 p.

Englehardt, Z., O.F.M., 1915. *The Missions and Missionaries of California.* James H. Barry Co., San Francisco, Vol. 4, 817 p.

———. 1930. *San Buenaventura: The Mission by the Sea.* Mission Santa Barbara, 166 p.

Gifford, E. W., 1940. Californian Bone Artifacts. *Anthropological Records,* Univ. of Calif., Berkeley, 3: 153-237.

———. 1947. Californian Shell Artifacts. *Anthropological Records,* Univ. of Calif., Berkeley, 9: 1-132.

Grant C., 1965. *The Rock Paintings of the Chumash.* Univ. of Calif., Berkeley. 163 p.

Greenwood, R. S., 1969. The Browne Site: Early Milling Stone Horizon in Southern California. *Memoirs of the Society for American Archaeology, No. 23,* Salt Lake City. [In press].

Greenwood, R. S. and R. O. Browne, 1963. Preliminary Survey of the Rancho Canada Larga, Ventura County, California. *Archaeological Survey Annual Report 1962-1963,* Univ. of Calif., Los Angeles, p. 463-513.

Harrington, J. P., 1928. Exploration of Burton Mound at Santa Barbara, California. *Bureau of American Ethnology, 44th Annual Report,* Washington, p. 21-168.

Heizer, R. F., 1949. Curved Single-Piece Fishhooks of Shell and Bone in California. *American Antiquity,* 15: 89-97.

———. 1955. California Indian Linguistic Records: The Mission Indian Vocabularies of H. W. Henshaw. *Anthropological Records,* Univ. of Calif., *Berkeley,* 15: 85-202.

Heye, G. G., 1921. Certain Artifacts from San Miguel Island, California. *Indian Notes and Monographs, Museum of the American Indian,* Heye Foundation, New York, Vol. 7, No. 4, 211 p.

HOOVER, M., H. E. RENSCH AND E. G. RENSCH, 1932. *Historic Spots in California,* Stanford Univ., Palo Alto, 411 p.

HYATT, E., 1933. Ventura County Investigation. *Calif. Div. of Water Resources, Bull. 46,* 244 p.

KOVEL, R. M. AND T. H. KOVEL, 1953. *Dictionary of Marks — Pottery and Porcelain.* Crown Publishers, Inc., New York, 278 p.

KROEBER, A. L., 1925. Handbook of the Indians of California. *Bureau of American Ethnology, Bull. 78,* 995 p.

LANDBERG, L. C. W., 1965. The Chumash Indians of Southern California. *Southwest Museum Papers, No. 19,* 158 p.

LIVINGSTON, A. JR. AND W. C. PUTNAM, 1933. Geological Journeys in Southern California. *Los Angeles Junior College Publication No. 1,* 104 p.

MCKUSICK, M. B., M. KOWTA, S. ROOTENBERG, F. CURTIS, R. S. GREENWOOD, A. T. GILMAN, AND B. M. SCHWARTZ, 1961. Excavations at Goleta. *Archaeological Survey Annual Report 1960-1961,* Univ. of Calif., Los Angeles, p. 339-463.

MORIARTY, J. R. AND M. KEISTMAN, 1963. A New Translation of the Summary Log of the Cabrillo Voyage in 1542. *San Diego Science Foundation, Occasional Paper No. 2,* La Jolla, 44 p.

NARVAES, N. D. J. M., 1823. *Carta Esferica delos Territorios de la Alta y Baja Californias y Estado de Sonora.* Baja California.

NATHAN, P. D. AND L. B. SIMPSON, Editor, 1962. *The Letters of Jose Senan, O.F.M. . . . 1796-1823.* Ventura County Historical Society, Ventura, 175 p.

NIEHOFF, A., 1952. Otoliths as Ornaments. *Wisconsin Archaeologist,* n.s., 33: 223-224.

NORRIS, R. M., 1966. Personal communication, June 7.

OLSON, R. L., 1930. Chumash Prehistory. *Publications in American Archaeology and Ethnology,* Univ. of Calif., Berkeley, 28: 1-21.

ORR, P. C., 1956. Customs of the Canalino. *Santa Barbara Museum of Natural History Occasional Papers No. 6,* 26 p.

REINMAN, F. M., 1964. Maritime Adaptation on San Nicolas Island, California. *Archaeological Survey Annual Report 1963-1964,* Univ. of Calif., Los Angeles, p. 47-77.

ROBINSON, E., 1942. Shell Fishhooks of the California Coast. *Occasional Papers of Bernice P. Bishop Museum,* 17: 57-65.

ROGERS, D. B., 1929. *Prehistoric Man of the Santa Barbara Coast.* Santa Barbara Museum of Natural History, 452 p.

SAN BUENAVENTURA MISSION, 1782-1809. Ms., *Libro Primerio de los Bautismos . . .*

———. 1782-1893. Ms., *[Register of Marriages] . . .* [Originals in the San Buenaventura Mission, Ventura].

SIMPSON, L. B., Editor, 1961. *Journal of Jose Longinos Martinez . . . 1791-1792.* Santa Barbara Historical Society, Huntington Library, 114 p.

SUSIA, M., 1962. The Soule Park Site (Ven-61). *Archaeological Survey Annual Report 1961-1962,* Univ. of Calif., Los Angeles, p. 157-233.

WALLACE, W. J., 1955. Archaeology of the Gilmore Ranch Site, Ventura County, California. *The Masterkey,* 29: 8-19.

WHEELER, G. M., 1879. *Report Upon United States Geographical Surveys West of the One Hundredth Meridian, Archaeology.* Engineer Dept., U. S. Army, Washington, Vol. 7, 485 p.

WISSLER, M., 1958. A Canalino Site Near Deer Canyon. *The Masterkey,* 32: 73-87.

WOODWARD, A., 1965. Indian Trade Goods. *Oregon Archaeological Society Publication No. 2,* 38 p.

APPENDIX A
FISH REMAINS, PRIMARILY OTOLITHS, FROM A VENTURA, CALIFORNIA, CHUMASH VILLAGE SITE (VEN-3)

JOHN E. FITCH[1]

INTRODUCTION

Although diaries and logbooks of early Spanish explorers inform us that the Chumash Indians of southern California reaped an excellent harvest of fishes from the nearby sea (Landberg, 1965), archaeological investigations of Chumash sites during the past two decades have failed to substantiate these reports (Table 1).

Only in 3 of 17 publications concerning scientific investigations of Chumash sites on offshore islands as well as the mainland have more than four species been recognized from among the relatively few fish remains salvaged during screening operations (Table 1). No fish remains were reported for one site, and at five other sites the remains were reported only as "fish." At eight sites, one or two kinds of fish were recognized, if one is willing to accept the term "shark" for reporting a species.

I have long suspected that the failure of archaeologists to find fish remains in our coastal Indian middens has been a result of (1) inadequate sampling techniques, (2) an inability to recognize fish remains for what they are, or (3) a combination of these two factors. Fish otoliths, for instance, are almost infallible objects for recognizing their former owners (Fitch, 1957), yet seldom have they been reported in archaeological literature. Only Walker (1951) and Meighan (1959) have reported fish otoliths (white seabass) from Chumash sites, although otoliths have been reported from one other coastal site (Shumway, Hubbs, and Moriarty, 1961) and from middens on the shores of inland lakes and waterways (Niehoff, 1952; Priegel, 1963; Witt, 1960). In addition, Fitch (1965b) and Baxter (1966) mention several Californian fishes that have been represented in Indian middens by their otoliths.

I had not realized how completely inadequate the archaeologist's techniques were for recovering fish remains, including their so-called "microanalysis" (Curtis, 1966), until Mrs. Roberta S. Greenwood gave me an opportunity to examine the residue that had passed through the ⅛-inch mesh screens used to sample the Ventura (Ven-3) site.

TABLE 1
Fish Remains Reported from Chumash Village Sites

Locality	*Authority*	*Fish remains reported*
1. Arroyo Grande, San Luis Obispo Co.	Wallace, 1962	16 examples, mostly vertebrae: California sheephead only fish recognized.
2. Goleta, Santa Barbara Co.	McKusick et al., 1961	fish remains, mostly vertebrae of extremely small size in 1/8-inch screen.
3. Burton Mound, Santa Barbara Co.	Harrington, 1928	numerous unidentified fish bones, tooth plates of bat stingray, jaw tip of swordfish, and "excrescences from the scapula of the horse mackerel."
4. Soule Park, Ventura Co.	Susia, 1962	no fish bones collected or identified.
5. Triunfo Rockshelter, Ventura Co.	Kowta and Hurst, 1960	18.3 grams of fish bone from four control columns, halibut tentatively identified.

[1]Marine Biologist, California Department of Fish and Game, Terminal Island, 90731

TABLE 1 *(Continued)*
Fish Remains Reported from Chumash Village Sites

Locality	*Authority*	*Fish remains reported*
6. Pt. Mugu, Ventura Co.	Follett, 1932	ten fish species identified: white shark, mako, angel shark, swordfish, California halibut, barracuda, yellowtail, bonito sheephead, and rockfishes.
7. Gilmore Ranch, Ventura Co.	Wallace, 1955	53 vertebrae from large ocean fish.
8. Deer Canyon, Ventura Co.	Wissler, 1958	1,238 fish bones mostly vertebrae from large fish such as shark.
9. Arroyo Sequit, Los Angeles Co.	Mitchell, 1959	fish bones, mostly vertebrae; those identified were from shark, white seabass, and sheephead.
10. Arroyo Sequit, Los Angeles Co.	Follett, 1963a	128 of 459 fish remains identified to 19 species in 14 families: salmon shark, mako, leopard shark, angel shark, shovelnose guitarfish, bat stingray, kelp bass, barracuda, yellowtail, Pacific mackerel, bonito, bluefin tuna, albacore, blacksmith, sheephead, bocaccio, chilipepper, rockfish, specklefin midshipman, and giant kelpfish.
11. Century Ranch, Los Angeles Co.	Follett, 1963b	2 teeth and 266 vertebrae (176 identifiable) representing 17 species in 12 families: mako, leopard shark, blue shark, soupfin shark, angel shark, shovelnose guitarfish, California halibut, kelp bass, barracuda, yellowtail, Pacific mackerel, bonito, oceanic skipjack, albacore, white seabass, sheephead, and rockfish.
12. Malaga Cove, Los Angeles Co.	Walker, 1951	unidentified fish bones and five white seabass otoliths.
13. Anacapa Island	McKusick, 1959	fish listed as important but no bones collected or identified.
14. San Nicolas Island	Reinman and Townsend, 1960	fish remains reported scattered over all the island's sites but none collected or identified.
15. San Nicolas Island	Meighan and Eberhart, 1953	species unknown but several of fairly large size, including sheephead.
16. Santa Catalina Island	Meighan, 1959	1,883 fish bones, including those from white seabass, sheephead, and two species of ray.
17. San Clemente Island	McKusick and Warren, 1959	not much bone present and most of it appeared to be fish.

The manuscript report on this site (Greenwood and Browne, 1969) states that 13 pits (each 1 by 2 by 0.7 m) were screened with ¼-inch mesh during their routine investigation, and that 9 of these 13 pits were double-screened with ⅛-inch mesh. Since "practically none [otoliths] whatever were found in the ¼-inch screens," it must be assumed that the 5,541 otoliths that turned up during routine screening were from the nine, double-screened pits representing 9.8 m^3 of "dirt" (Table 2). Two control pits, each 1 by 1 by 0.7 m, yielded an additional 1,816 otoliths from 2.8 m^3 of dirt that was washed through ⅛-inch mesh screens prior to sorting.

Although these 7,357 otoliths were from 10 species of fish, it was obvious that many additional species should have been there but were not. Accounts of early explorers mentioned "sardines" the Indians used for bait, as well as bonitos, perch, and bass. It also seemed highly unlikely that the Indians did not know about the grunion runs that take place on several consecutive nights every two weeks during spring and summer, yet the otoliths of these species were either missing or in short supply among the fish remains retrieved with the ⅛-inch mesh screens.

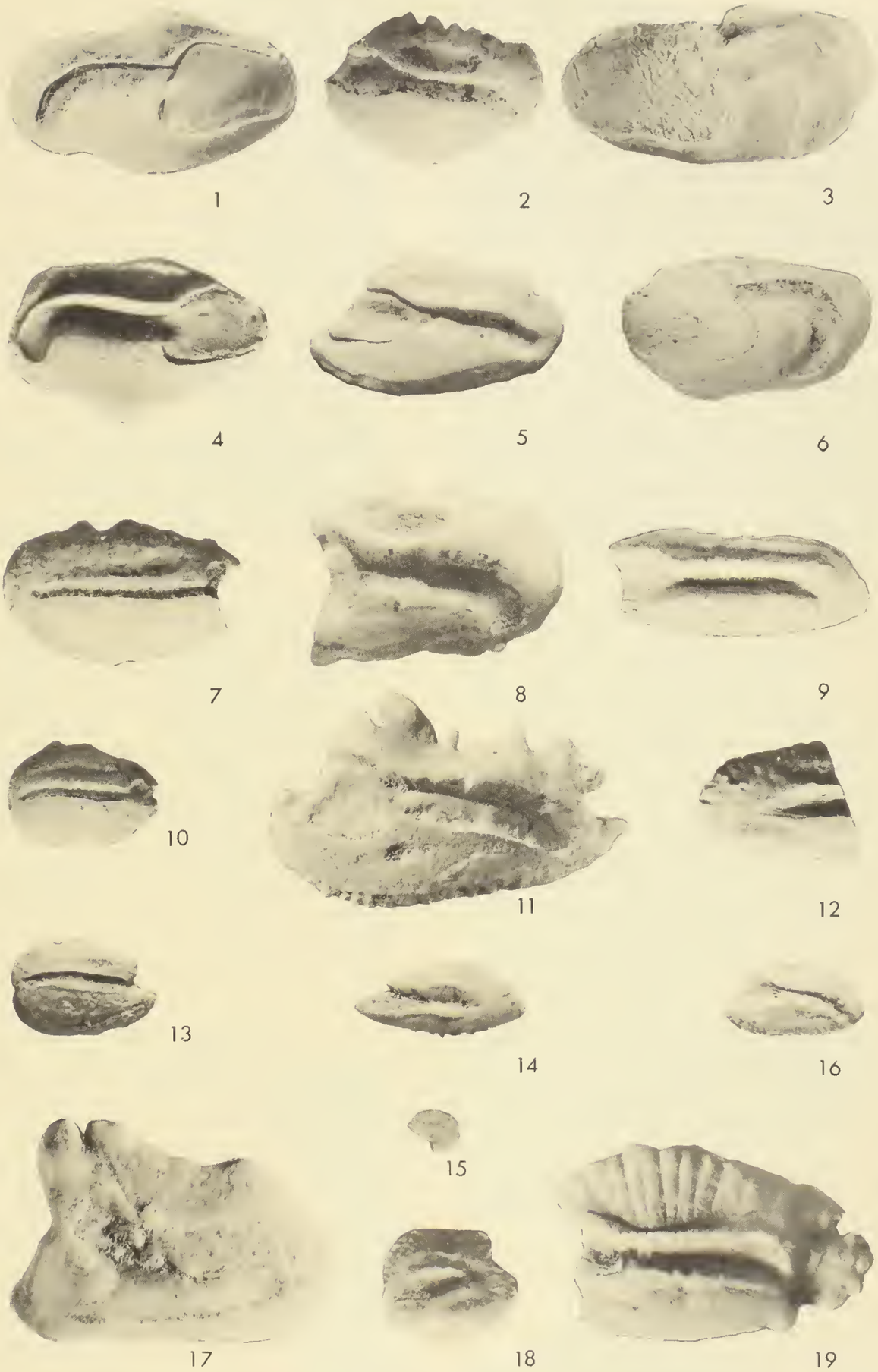
Similarly, elasmobranch remains (sharks, rays, skates, etc.) were not as well represented as they should have been, whether fishing was by gill net, beach seine, or hook and line. The general collection yielded teeth of only five species (Table 2), although some of the shark vertebrae (not listed in this report) could have been from other species.

Additional easily-recognized fish remains recovered during routine screening operations included the bill of a swordfish, *Xiphias gladius*, the fused pharyngeals of barred surfperch, *Amphistichus argenteus*, jaw fragments from the California sheephead, *Pimelometopon pulchrum*, branchiostegal rays from a very large fish, possibly the giant sea bass, *Stereolepis gigas*, and "bulbous bony growths" from the crevalle jack, *Caranx hippos caninus*. Thus, although the remains of 20 species were easily distinguished among the fish residue retained by the ⅛-inch mesh screens used for routine excavation of the site, there should have been more than that if the Chumash were the fishermen they were credited as being.

At my request, Mrs. Greenwood returned to the site and opened two new pits from which she removed small samples (perhaps 0.25 m^3 each) upon which I could apply some recovery techniques that I had used successfully for determining fish faunas in numerous fossil deposits. Using a metal tub, I submerged in water the residue that had passed through a ⅛-inch mesh screen, producing a soupy mixture that could be manipulated easily in fine-mesh screens. Next, I inserted a 2 mm screen (U. S. Standard Sieve Series) over a 1 mm screen, and washed the soupy mixture through these two screens (9 and 18 openings per inch, respectively) a couple of quarts at a time. The clean residue retained by each screen was dumped onto newspapers periodically, and allowed to dry in the sun. The dried residue was sacked for processing at a later date utilizing a binocular microscope at six magnifications, and examining a tablespoonful at a time after spreading it evenly in a square, plastic, icebox-dish lid with slightly raised edges.

The 18-mesh screen yielded an additional nine kinds of otoliths and three kinds of elasmobranch teeth from these special samples, but species that should have been present, still were not found, so I processed a small quantity of residue through a 0.5 mm screen (32 meshes per inch). When the tiny teeth of two common sharks were found in the residue retained by the 32-mesh screen, I examined the teeth of seven elasmobranchs that occur commonly along our coast (shovelnose guitarfish, *Rhinobatos productus;* thornback, *Platyrhinoidis triseriata;* round stingray, *Urolophus halleri;* butterfly ray, *Gymnura marmorata;* Pacific electric ray, *Torpedo californica;* gray smoothhound, *Mustelus californicus;* and banded guitarfish,

Figure 1. Inner face, left sagitta of *Genyonemus lineatus* 9.2 mm long from Ven-3.. *Figure 2.* Inner face, right sagitta of *Hyperprosopon argenteum* 6.7 mm long from Ven-3. *Figure 3.* Inner face, right sagitta of *Cynoscion nobilis* 17.0 mm long from Ven-3. *Figure 4.* Inner face, left sagitta of *Seriphus politus* 8.3 mm long from Ven-3. *Figure 5.* Inner face, right sagitta of *Phanerodon furcatus* 7.8 mm long from Ven-3. *Figure 6.* Inner face, right sagitta of *Umbrina roncador* 10.6 mm long from Ven-3. *Figure 7.* Inner face, left sagitta (rostrum missing) of *Atherinopsis californiensis* 5.8 mm long from Ven-3. *Figure 8.* Inner face, right sagitta (anterior tip missing) of *Embiotoca jacksoni* 8.4 mm long from Ven-3. *Figure 9.* Inner face, right sagitta (anterior tip missing) of *Sphyraena argentea* 13.3 mm long from Ven-3. *Figure 10.* Inner face, left sagitta of *Atherinops affinis* 4.5 mm long from Ven-3. *Figure 11.* Inner face, right sagitta of *Rhacochilus vacca* 10.8 mm long from Ven-3. *Figure 12.* Inner face, left sagitta (anterior half missing) of *Leptocottus armatus* 3.0 mm long from Ven-3. *Figure 13.* Inner face, left sagitta of *Leuresthes tenuis* 3.0 mm long from Ven-3. *Figure 14.* Inner face, right sagitta of *Engraulis mordax* 3.7 mm long from Ven-3. *Figure 15.* Inner face, right sagitta (antero-ventral half missing) of *Ceratoscopelus townsendi* 1.9 mm long from Ven-3. *Figure 16.* Inner face, right sagitta of *Chromis punctipinnis* 3.1 mm long from Ven-3. *Figure 17.* Inner face, left sagitta of *Porichthys notatus* 9.5 mm long from Ven-3. *Figure 18.* Inner face, left sagitta of *Citharichthys stigmaeus* 2.8 mm long from Ven-3. *Figure 19.* Inner face, right sagitta (rostrum missing) of *Sebastodes crameri* 9.4 mm long from Ven-3.



1 2 3

4 5 6

7 8 9

10 11 12

13 14 16

15

17 18 19

Photographs by Jack W. Schott.

Zapteryx exasperata) and found that all of the teeth of six of these species, even teeth from large adults, would pass through a screen with 18 openings per inch (equivalent to window screen). Most of the teeth of the gray smoothhound will also pass through an 18-mesh screen, as will many teeth from the diamond stingray, *Dasyatis dipterurus*, the swell shark, *Cephaloscyllium ventriosum*, and the several species of skates, *Raja* spp., that are found in local waters.

Armed with this information, I added a 32-mesh screen to the series used on approximately 0.1 m^3 of "dirt" from the burial pit excavated at Ven-3, and recovered one kind of otolith and three elasmobranch teeth not previously encountered (Table 2).

In addition to the 38 species listed below (Table 2), the residue that passed through the ⅛-inch mesh screen contained many jaw teeth from the Monterey Spanish mackerel, *Scomberomorus concolor*, and the California halibut, *Paralichthys californicus;* teeth and vertebrae of the Pacific mackerel, *Scomber diego,* the bonito, *Sarda chiliensis*, and the Pacific hake, *Merluccius productus;* a scute from the posterior lateral line of a Pacific jack-mackerel, *Trachurus symmetricus;* dermal denticles from the prickly shark, *Echinorhinus cookei*, and the angel shark, *Squatina californica;* and "wing" spines from several skates, *Raja* spp.

Although many of the Ven-3 fish remains are still to be identified, especially vertebrae, and the 45 species recognized to date are more than double any previous listing of fish remains from a Chumash site (Follett, 1963a), additional sampling probably would yield otoliths and teeth of 10 to 15 species that were not encountered in any of the residue examined. Seven of the fishes that Follett (1963a) identified from Arroyo Sequit were not found at Ven-3: salmon shark, *Lamna ditropis;* kelp bass, *Paralabrax clathratus;* yellowtail, *Seriola dorsalis;* bluefin tuna, *Thunnus thynnus;* albacore, *Thunnus alalunga;* specklefin midshipman, *Porichthys myriaster;* and giant kelpfish, *Heterostichus rostratus*, nor were two of the fishes that Follett (1963b) reported from the Century Ranch site: blue shark, *Prionace glauca,* and oceanic skipjack, *Katsuwonus pelamis.*

SPECIES ACCOUNTS

Hexanchidae — cow sharks

Notorynchus maculatus — sevengill shark

Sevengill sharks are reported to reach lengths of 15 feet (Roedel, 1953), but a 7-footer is quite large for California. A 5-foot 7-inch male caught at Santa Rosa Island in 1961 weighed 41 pounds. They range from northern British Columbia to below San Carlos, but they are not often taken south of Pt. Conception and then usually in quite deep water (600 feet or deeper). The Chumash could have captured sevengill sharks in gill nets, but they probably caught them on hook and line in deep water.

Material: 2 teeth, both from ⅛-inch and larger screen.

Heterodontidae — horn sharks

Heterodontus francisci — horn shark

Horn sharks are abundant in rocky subtidal areas between about Morro Bay, California, and Magdalena Bay, Baja California. These sharks reach lengths of about 4 feet, and are quite sluggish and easily caught by hand when skindiving. The Chumash could have caught them by hand (assuming some skindiving was done) or in gill nets set in and around kelp beds, but they most likely were caught in traps or on hook and line.

Material: 2 teeth, both from the 32-mesh screen.

Lamnidae — mackerel sharks

Isurus oxyrinchus — mako

The mako is fairly common in offshore waters and around islands between about San Francisco and Magdalena Bay, where they usually are caught at or near the surface. A record-sized specimen was 11 feet long (Applegate, 1966), but the usual mako in our waters is shorter than 8 feet. The Chumash probably caught the mako on hook and line using a fairly large bait, but an occasional individual might have been harpooned at the surface. Follett (1932, 1963a, 1963b) reported mako remains from Point Mugu, Arroyo Sequit, and Century Ranch sites.

Material: 5 teeth, all retained by ⅛-inch and larger screen.

Scyliorhinidae — cat sharks

Cephaloscyllium ventriosum — swell shark

The sluggish swell shark inhabits much the same territory as the horn shark, but is especially abundant around islands between about Monterey Bay and Magdalena Bay. It also occurs in the northern Gulf of California. A large specimen probably would not exceed three feet. Swell sharks are easily trapped in rocky, kelpbed areas, which is probably how the Chumash caught them, but occasional individuals are caught on hook and line. The jaws of the swell shark contain about 600 teeth.

Material: 2 teeth, both from the 32-mesh screen.

Carcharhinidae — requiem sharks

Galeorhinus zyopterus — soupfin shark

The soupfin shark ranges from northern British

Columbia to about Magdalena Bay. Females occur principally south of Point Conception where they often inhabit waters as shallow as 100 feet. A 6½-foot female may weigh as much as 100 pounds, but 50- to 70- pounders are the usual size. The soupfin is easily caught in gill nets, but the Chumash probably caught them on hook and line while fishing the bottom in intermediate depths. Follett (1963b) reported soupfin shark remains from the Century Ranch site.

Material: 16 teeth, all but one from the 18-mesh screen.

Triakis semifasciata — leopard shark

The leopard shark has been caught between Oregon and Cape San Lucas, as well as in the Gulf of California. It usually frequents shallow areas where the bottom is sandy, but also is seen in shallow rocky areas around offshore islands. The Chumash probably caught leopard sharks with beach seines and hook and line, but a few probably

TABLE 2
Fish Otoliths and Teeth from Ventura Chumash Site (Ven-3)

Pit location	*General collection*	*W11-S6*	*E15-S3*	*E11-S4*	*E13-S5*	*N4-E28*	
Cubic meters screened	*9.8*	*1.4*	*1.4*	*0.2*	*0.3*	*0.1*	
Smallest screen used	*1/8"*	*1/8"*	*1/8"*	*18-mesh*	*18-mesh*	*32-mesh*	*Totals*
OTOLITHS							
Genyonemus lineatus	5,509	691	1,113	125	133	84	7,655
Engraulis mordax				10	9	11	30
Seriphus politus	17	3	3		1		24
Sebastodes spp.	2	1		3	4	2	12
Umbrina roncador	8	1	2				11
embiotocid perch				2	2	5	9
Lenresthes tenuis				1	4		5
Hyperprosopon argenteum	1				3		4
Sphyraena argentea	2				2		4
Cynoscion nobilis	1						1
Embiotoca jacksoni		1					1
Porichthys notatus	1						1
Phanerodon furcatus			1				1
Rhacochilus vacca				1			1
Atherinops affinis				1			1
Atherinopsis californiensis					1		1
Leptocottus armatus				1			1
Chromis punctipinnis				1			1
Citharichthys stigmaeus					1		1
Ceratoscopelus townsendi						1	1
Total otoliths	5,541	697	1,119	145	160	103	7,765
TEETH							
Raja spp.				8	26	15	49
Squatina californica	4			8	15	7	34
Myliobatis californicus	20+			7	3		30+
Galeorhinus zyopterus	1			5	10		16
Squalus acanthias				5	7	1	13
Rhinobatos productus				2*	4*	5	11
Triakis semifasciata				2	2	3	7
Isurus oxyrinchus	5						5
Mustelus californicus					2*	1	3
Notorynchus maculatus	2						2
Cephaloscyllium ventriosum						2	2
Heterodontus francisci						2	2
Platyrhinoidis triseriata						1	1
Total teeth	32+			37	69	37	175+

*found only after using 32-mesh screen

were taken with gill nets. A 5-footer could be considered large, although they may reach 7 feet. The jaws of the leopard shark contain approximately 400 teeth. Follett (1963a, 1963b, 1964) reported their remains from Arroyo Sequit, the Century Ranch, and a Drakes Bay site.

Material: 7 teeth, all in 18-mesh and smaller screens.

Mustelus californicus — gray smoothhound

The gray smoothhound is abundant in shallow water off southern California, but not to the north, although it has been reported between San Francisco Bay and the Gulf of California. Most individuals do not exceed about 3 feet, and because of their small size they are easily caught in small-mesh gill nets. The Chumash probably also took gray smoothhounds on hook and line and in beach seines. The jaws of the gray smoothhound contain over 900 teeth.

Material: 3 teeth, all in 32-mesh screen.

Squalidae — dogfish sharks

Squalus acanthias — spiny dogfish

The spiny dogfish ranges singly and in schools throughout the north Pacific Ocean, to Sebastian Viscaino Bay, Baja California on our coast. The females usually attain larger sizes than males, and are reported to reach 5 feet, but a 4-footer is a large fish in our area. Trawling in the Ventura area yields best catches in 100 to 250 feet of water. The Chumash probably caught spiny dogfish on hook and line in these intermediate depths, but a few could have been taken in gill nets in shallower water.

Material: 13 teeth, all from mesh smaller than ⅛-inch.

Echinorhinus cookei — prickly shark

The prickly shark is rare in southern California waters, perhaps only two or three individuals being taken per year by gill nets fished in deep water. A record specimen for the eastern Pacific was a 10-footer weighing approximately 490 pounds caught on hook and line at Guadalupe Island (Collyer, 1953). The Chumash probably caught these on hook and line in fairly deep water.

Material: several dermal denticles recovered with 18-mesh screen.

Squatinidae — angel sharks

Squatina californica — Pacific angel shark

Although angel sharks range from southern Alaska into the Gulf of California, they are not abundant north of Point Conception. Skin divers often observe them buried in sand or mud at depths of 8 to 150 feet or more, but greatest concentrations are noted in 50 to 70 feet. They are reported to attain lengths of about 5 feet; a 44-inch female weighed 31 pounds. The Chumash could have caught a few angel sharks with beach seines, but most probably were caught on hook and line at intermediate depths. Follett (1932, 1963a, 1963b) reported angel shark remains from Point Mugu, Arroyo Sequit, and Century Ranch sites.

Material: 34 teeth, mostly from screens smaller than ⅛-inch, and several hundred dermal denticles from 18- and 32-mesh screens.

Rhinobatidae — guitarfishes

Rhinobatos productus — shovelnose guitarfish

The shovelnose guitarfish is one of the commonest elasmobranchs throughout much of its range between Monterey Bay and the Gulf of California. A record specimen was 60½ inches long and weighed 40½ pounds, but most are shorter than 4 feet. The jaws of a single individual contain about 3500 teeth, so chances of recovering them are excellent if proper screens are used. The Chumash probably caught most shovelnose guitarfish in beach seines, but some may also have been taken with hook and line and by harpooning in the surf zone. Follett (1963a, 1963b) reported their remains from both Arroyo Sequit and the Century Ranch.

Material: 11 teeth, all from the 32-mesh screen.

Platyrhinoidis triseriata — thornback

The thornback ranges from about Elkhorn Slough to Sebastian Viscaino Bay, but is rare north of Morro Bay. It seems to prefer somewhat deeper water than the shovelnose guitarfish, but sometimes aggregates in the shallow flats of bays and lagoons. A large individual might be 30 inches long and weigh 6 or 7 pounds. The Chumash probably caught the thornback on hook and line, but they may have also taken a few in gill nets and with beach seines. The jaws of an adult thornback contain about 2,000 teeth.

Material: 1 tooth from the 32-mesh screen.

Rajidae — skates

Raja spp. — skates

Although six species of skates occur offshore from Ventura County, probably only two or three species were commonly caught by the Indians. I was unable to find foolproof characters for distinguishing the teeth from various species of skates, but because of their large size (weights exceeding 150 pounds have been reported), teeth of large,

adult *R. binoculata* can be distinguished, and because the teeth of *R. inornata* possess a longer central spine than similar-sized teeth from other skates, they too can sometimes be distinguished. Both of these skates are abundant offshore from Ventura, and probably were caught in intermediate depths by Chumash using hook and line. Skate jaws contain about 800 teeth.

Material: 49 teeth, all from screens smaller than ⅛-inch mesh and numerous "wing" spines, also from small-mesh screens.

Myliobatidae — eagle rays

Myliobatis californicus — bat stingray

Bat stingrays range from Oregon to Magdalena Bay, occurring in shallow bays, along the mainland coast, and around offshore islands. A record specimen weighed 209 pounds, but most individuals caught will weigh less than 50 pounds. The Chumash probably harpooned a few bat stingrays in shallow water, but they very likely took most with beach seine and hook and line. The two kinds of ray remains reported by Meighan (1959) probably were lateral and median teeth from *M. californicus;* Harrington (1928) reported bat stingray teeth from Burton Mound, and Follett (1963a) reported some from Arroyo Sequit. The Chumash may have used the stings of these and other rays for harpoon heads, which could account for the absence of such remains in coastal middens.

Material: more than 30 teeth, most retained in ⅛-inch and larger screens.

Engraulidae — anchovies

Engraulis mordax — northern anchovy

The northern anchovy is a schooling fish that ranges from British Columbia to Magdalena Bay and offshore for more than 100 miles. They are reported to attain a length of 9 inches, but a 7-inch fish could be considered quite large. *E. mordax* probably is the "sardine" mentioned in early Spanish accounts as being the bait fish used by the Chumash. Anchovy otoliths could have gotten into the midden by having been eaten by a large predator fish (halibut, bonito, etc.) which subsequently was caught by the Indians while the anchovies were still in its stomach. If the Indians discarded the anchovy-laden stomach, the anchovy otoliths would have accompanied the discarded offal. They also could have gotten into the midden by having passed through a sea gull or pelican that ate anchovies elsewhere, and stopped at the Indian village to scrounge for additional food. Most of the anchovy otoliths probably came from fish (anchovies) that the Indians fished for with beach seines in the surf zone.

Material: 30 otoliths (Fig. 14) all from 18- and 32-mesh screens.

Myctophidae — lanternfishes

Ceratoscopelus townsendi — dogtooth lampfish

This little fish (attaining perhaps 3 inches when fully grown) is widely distributed in tropical and temperate waters of the Pacific, Indian, and Atlantic Oceans. They seldom approach within 600 feet of the surface, and would not normally be captured with any gear except a plankton net or a fine-mesh midwater trawl. They are eaten by predatory species, especially albacore and rockfish, so the otolith found at Ven-3 is presumed to have gotten there in the discarded offal from a predatory fish the Indians had caught.

Material: 1 broken otolith (Fig. 15) from the 32-mesh screen.

Merlucciidae — hakes

Merluccius productus — Pacific hake

The Pacific hake is one of the three or four most abundant species inhabiting moderate to deep water off our coast between Alaska and the southern tip of Baja California. They are said to reach lengths of 3 feet, but a 30-inch fish is rare; a 26-inch female weighed slightly less than 4 pounds. The Chumash probably caught hake on hook and line while fishing on or near the bottom in moderate depths.

Material: numerous jaw fragments and vertebrae, mostly from smaller mesh than ⅛-inch.

Bothidae — lefteyed flounders

Paralichthys californicus — California halibut

California halibut have been captured between Alsea, Oregon, and Magdalena Bay, but they are not abundant north of San Francisco. They live on the bottom, usually in water shallower than 200 feet, and often in the surf zone or in coastal bays and estuaries. A 5-foot long 72-pound female seems to be a record size. Based upon the number of halibut teeth screened at Ven-3, it must have contributed heavily to the Chumash diet, but no otoliths were found in the relatively small quantity of midden material examined. The Indians probably caught most of their halibut with hook and line but some undoubtedly were taken in beach seines also. Kowta and Hurst (1960) tentatively identified halibut remains from the Triunfo Rockshelter and Follett (1932, 1963b) found them

among fish remains at Point Mugu and the Century Ranch.
Material: numerous jaw fragments and teeth, mostly from the 9- and 18-mesh screens.

Citharichthys stigmaeus — speckled sanddab

The speckled sanddab ranges along the coast from southeastern Alaska to Sebastian Viscaino Bay, usually in water shallower than 200 feet, and often just outside the surf zone. A large fish might be 5 inches long and weigh less than one ounce. Although the Indians could have caught speckled sanddabs with a beach seine, the eroded condition of the otolith found at Ven-3 indicates it had undergone some digestive action, probably in the stomach of a predator the Indians had caught.
Material: 1 otolith (Fig. 18) from the 18-mesh screen.

Serranidae — basses

Stereolepis gigas — giant sea bass

Giant sea bass range from San Francisco Bay to Magdalena Bay and throughout the northern Gulf of California. During June through September, large adults are plentiful in shallow water, particularly off Anacapa and Santa Cruz Islands. At that time they are quite vulnerable to hook-and-line fishing with large baits. A record fish was just over 7 feet long and weighed 557 pounds. Several large branchiostegal rays found during general screening at Ven-3 are believed to be from this species.
Material: several branchiostegal rays from the ¼-inch screen.

Atherinidae — silversides

Leuresthes tenuis — grunion

The grunion ranges from Monterey Bay to about Magdalena Bay, and is also found in the northern Gulf of California. A large female might attain a length of 8 inches and a weight of 2 ounces. These fish spawn on the beach in great numbers following the nighttime high tides that occur for several days after full moon and new moon in the spring and early summer. When not spawning, grunion can be found in loose schools near the surface in shallow water outside the breakers. The Chumash probably took some grunion with beach seines, but they very likely also collected them with bare hands during nighttime spawning runs.
Material: 5 otoliths (Fig. 13) all from 18- and 32-mesh screens.

Atherinops affinis — topsmelt

Topsmelt range from the Straits of Juan de Fuca to and into the Gulf of California. Various subspecies inhabit bays, kelp beds, and offshore island areas where they live at or near the surface. A 14½-inch female weighing about 12 ounces seems to be a near-record size. The Chumash probably caught topsmelt incidentally with a beach seine.
Material: 1 otolith (Fig. 10) from the 18-mesh screen.

Atherinopsis californiensis — jacksmelt

Jacksmelt have been recorded between northern Oregon and about Magdalena Bay in much the same habitat as the topsmelt and grunion. The jacksmelt does grow larger than the topsmelt and grunion (to perhaps 22 inches) and will take a baited hook, but the hook has to be quite small to catch them. The Chumash probably caught jacksmelt incidentally in gill nets and beach seines.
Material: 1 otolith (Fig. 7) from the 9-mesh screen.

Sphyraenidae — barracudas

Sphyraena argentea — California barracuda

The California barracuda ranges from southeastern Alaska to Magdalena Bay, but it seldom travels north of Point Conception except during periods when ocean temperatures are warmer than usual. At times, dense schools of barracuda can be found near the surface throughout the year, especially around the offshore islands. They are said to reach a length of 4 feet, which was about the size of a record 17-pound female taken in 1958. Although many barracuda are caught with gill nets by present-day fishermen, the Chumash probably caught most of theirs on hook and line. Follett (1932, 1963a, 1963b) reported barracuda remains from Point Mugu, Arroyo Sequit, and the Century Ranch.
Material: 4 otoliths (Fig. 9), 2 from ⅛-inch mesh and 2 from 9-mesh screens.

Carangidae — jacks

Trachurus symmetricus — Pacific jackmackerel

The Pacific jackmackerel is one of the three or four most abundant species off our coast, ranging from British Columbia to Cape San Lucas and offshore for several hundred miles. They are a schooling species, and usually are found offshore and around islands and banks within 200 feet of the surface. Large jackmackerel will take a baited hook, but they also are occasionally caught in gill nets. The Indians probably caught them with both of these methods. Although no jackmackerel otoliths were found at Ven-3, I have seen them from other coastal middens in residue that had passed through ⅛-inch screens.
Material: 1 posterior lateral line scute from the 9-mesh screen.

Caranx hippos caninus — crevalle jack

During the past century (at least) of record keeping, the crevalle jack has not been reported north of central Baja California. It ranges from there south to Panama. A large specimen might be 3 feet long and weigh 15 pounds. A peculiarity of this species is large "tumorous" bony growths in the flesh beneath some of the dorsal fin spines and above some of the ventral fin spines and rays. The species probably has ranged north into California waters during extended periods of warm water. They readily will take a baited hook. The "bony excrescences from the scapula of the horse mackerel" reported by Harrington (1928) from Burton Mound, Santa Barbara County, probably were from the crevalle jack, as were the several bulbous growths from ⅛-inch mesh screens.

Scombridae — mackerels

Scomber diego — Pacific mackerel

Pacific mackerel are an abundant, schooling species throughout much of their range: Gulf of Alaska south throughout the Gulf of California and offshore for 50 miles or more. Although a couple of "giants" were about 25 inches long and weighed more than 6 pounds each, foot-long mackerel weighing a pound each are more typical sizes. The Chumash probably caught most of their mackerel near the surface with baited hooks, but some could have been taken with gill nets also. The otoliths of *Scomber* break quite easily and probably would not be recovered except in 18- or 32-mesh screens. Follett (1963a, 1963b) reported mackerel remains from Arroyo Sequit and the Century Ranch.

Material: numerous jaw fragments and vertebrae, mostly from the 9- and 18-mesh screens.

Sarda chiliensis — Pacific bonito

Although the Pacific bonito travels at the surface in dense schools throughout much of the area between southern British Columbia and Banderas Bay, Mexico, it seldom ranges north of Point Conception unless the ocean is unusually warm. There is an unverified report of a 37-pound bonito, but specimens as heavy as 15 pounds are unusual; a 27-inch fish weighed 10½ pounds. These are voracious fishes and will accept almost any type of baited hook, which undoubtedly is how the Chumash caught most of theirs. Bonito otoliths are small, delicate, and easily broken; if found, they probably would be recovered almost exclusively in 9- or 18-mesh screens. Follett (1932, 1963a, 1963b) reported bonito remains from Point Mugu, Arroyo Sequit, and the Century Ranch.

Material: numerous jaw fragments and teeth in screens smaller than ⅛-inch.

Scomberomorus concolor — Monterey Spanish mackerel

Although the Monterey Spanish mackerel rarely is caught off the California coast today, it was commercially important in Monterey Bay during the 1870's and 1880's (Fitch and Flechsig, 1949), and probably was even more abundant prior to that. None of these fishes appears to have been caught during the period 1890 to 1931, and perhaps fewer than 30 have been reported since 1931. Its known range extends from just north of San Francisco to about Ensenada on the outer coast, and great schools of *S. concolor* abound in the upper Gulf of California (north of Guaymas and Los Angeles Bay). A large female observed in 1960 was 28¼ inches long and weighed 6¼ pounds. The teeth of *S. concolor* are almost identical to those of *S. sierra*, a closely related southern species that has been reported from California only twice. If jaw fragments are available, *S. concolor* can be distinguished by its smaller, more closely-set teeth. In the Gulf of California, native fishermen catch quantities of Monterey Spanish mackerel at the surface using handlines with an assortment of artificial lures and baits. These fish are also easily captured with gill-nets and beach seines. The Chumash probably caught them with all three types of gear.

Material: numerous jaw fragments and teeth, mostly from the 9- and 18-mesh screens.

Xiphiidae — swordfishes

Xiphias gladius — swordfish

Swordfish range through all warm temperate seas of the world, showing up off southern California only during a few summer months each year. They are easy to observe because their dorsal and tail fins break the surface. Most fish captured off our coast will weigh between 300 and 500 pounds. The Chumash probably harpooned the swordfish they were fortunate enough to encounter. Harrington (1928) and Follett (1932) reported swordfish remains from Chumash sites at Burton Mound and Point Mugu.

Material: 1 "sword" from ¼-inch screenings.

Sciaenidae — croakers

Genyonemus lineatus — white croaker

White croakers stay on or near the bottom, usually where it is sandy or sandy mud, but they are also in most other marine habitats too — to depths of 600 feet at least. They have been reported from Vancouver Island and Magdalena Bay, and

from most places in between. They are not choosy about their diet, taking just about any type of food offered, whether alive or dead. A 14½-inch fish, which is large for a white croaker, weighed 1.4 pounds. Although they are easily hooked, the Chumash probably caught most white croakers with gill nets, the only type of fishing gear that would result in all the otoliths being from approximately similar-sized fish. A random sample of 100 otoliths recovered from Ven-3 ranged in length from 8.2 to 11.7 mm; the 8.2 mm otolith would have been from a white croaker about 7 inches long, and the 11.7 mm otolith from a 10-incher. At these lengths they will average better than ½ pound each. Shumway, Hubbs, and Moriarty (1961) reported white croaker otoliths from the Scripps Estate Site, La Jolla.

Material: 7,655 otoliths (Fig. 1) mostly from ⅛-inch screens.

Seriphus politus — queenfish

Queenfish have been reported at most localities between Yaquina Bay, Oregon, and San Juanico Bay, Baja California, in much the same habitat as white croakers. They do not take a hook as readily as do white croakers, nor do they attain as large a size. A 12-inch fish, about as big as they grow, weighed just over 10 ounces. The large sizes of the otoliths recovered from Ven-3 indicates they too were taken with gill nets, probably at the same times and places as the white croakers.

Material: 24 otoliths (Fig. 4) mostly from ⅛-inch mesh.

Umbrina roncador — yellowfin croaker

Yellowfin croakers range from about Point Conception to Magdalena Bay in much the same habitat as white croakers and queenfish: generally shallow sandy or sandy mud bottoms along the open coast and in bays and estuaries. They seldom stray into very deep water, usually 30 feet or shallower. They will take a hook baited with fish, clams, and several other items, but the Chumash probably took most of their yellowfin croakers with beach seines. A 3-pound 9-ounce fish seems to be a record weight, and 16 inches approximately the maximum length.

Material: 11 otoliths (Fig. 6) mostly in ⅛-inch mesh.

Cynoscion nobilis — white seabass

The white seabass is the largest member of the croaker family inhabiting our waters, many individuals exceeding 40 pounds, with the recognized record being 83 pounds 12 ounces. They are schooling fishes and their known range extends from Juneau, Alaska, to Magdalena Bay and throughout the northern Gulf of California. The Chumash probably caught white seabass with hook and line while fishing in intermediate depths (60 to 120 feet). Their otoliths have been found in Chumash sites at Malaga Cove and Santa Catalina Island (Walker, 1951; Meighan, 1959), and other white seabass remains have been reported from the Century Ranch and Arroyo Sequit sites (Follett, 1963b; Mitchell, 1959).

A necklace in the Los Angeles County Museum of Natural History (Cat. no. A 5600/99) from a San Nicolas Island site, is made of white seabass otoliths alternating with *Olivella* shells.

Material: 1 otolith (Fig. 3) from the ¼-inch screen.

Embiotocidae — surfperches

Amphistichus argenteus — barred surfperch

The barred surfperch is one of 20 surfperches found in California waters. They range from Bodega Bay, California, to Playa Maria Bay, Baja California; they are found almost exclusively in the surf zone. A record fish was 17 inches long and weighed 4¼ pounds. The Chumash probably caught barred surfperch with beach seines.

Material: 2 sets of fused pharyngeals from ¼-inch mesh screens and numerous pharyngeal teeth from 18- and 32-mesh screens.

Hyperprosopon argenteum — walleye surfperch

Walleye surfperch are found in shallow water along sandy beaches, over areas of flat rock, and around piers from Vancouver Island to Santa Rosalia Bay, Baja California. At times they form loose schools containing thousands of individuals, but most schools will be made up of 100 to 500 fish. A 10¾-inch female weighed just over 14 ounces — a near record size. The Chumash probably caught most walleye surfperch in beach seines. Follett (1964) reported remains of *H. argenteum* from a Drakes Bay site.

Material: 4 otoliths (Fig. 2), 3 from the 9-mesh screen and the other from ⅛-inch mesh. Some of the 9 fragmented embiotocid otoliths might also have been this species.

Embiotoca jacksoni — black perch

Black perch are found in shallow water in and around kelp beds where the bottom is rocky, and in and around eel grass and pier pilings of bays and sheltered coastal areas. They range from Bodega Bay to Abreojos Point, Baja California, sometimes occurring singly and at other times in schools of a dozen or so individuals. Although a 15¼-inch fish is on record, a 12-incher is the largest one weighed (1½ pounds). The Chumash probably caught black perch with beach seines, but some could have been caught with hook and line. Follett (1964) reported black perch remains from a coastal site at Drakes Bay.

Material: 1 otolith (Fig. 8) recovered with the

⅛-inch screen. Some of the 9 embiotocid otolith fragments might also have been this species.

Rhacochilus vacca — pile perch

The pile perch ranges from Port Wrangell, Alaska, to San Martin Island, Baja California, where it occurs commonly in shallow water over both sandy and rocky substrate, around kelp and around pier pilings. A 17-inch female weighed just under 4 pounds, possibly a record size. The Chumash probably caught pile perch with a beach seine, but they might have caught some on hook and line and with gill nets also. Follett (1964) identified pile perch remains from a midden at Drakes Bay.

Material: 1 otolith (Fig. 11) from the 9-mesh screen. Some of the 9 embiotocid otolith fragments might also have been this species.

Phanerodon furcatus — white seaperch

Throughout their range from Vancouver Island to Pt. Cabras, Baja California, loose schools of white seaperch often abound over sandy and rocky bottom in depths of 10 to 100 feet. They do not grow as large as some of the other surfperches utilized by the Chumash, and they seldom will take a baited hook. A 12-incher, which is near maximum size, weighed only 13 ounces. The Chumash probably caught white seaperch with beach seine and gill net.

Material: 1 otolith (Fig. 5) from the ⅛-inch mesh. Some of the 9 embiotocid otolith fragments might also have been this species.

Pomacentridae — damselfishes

Chromis punctipinnis — blacksmith

The blacksmith ranges from Monterey Bay to about Turtle Bay, Baja California, but is not abundant north of Point Conception. They prefer kelp beds over other marine habitats, and often are seen in loose schools comprising thousands of individuals. They are said to reach lengths of 12 inches, but none that size has been weighed. The single otolith found in Ven-3 appeared to have been subjected to digestive action, probably in the stomach of some predatory fish. The Chumash may have caught blacksmiths on hook and line or in gill nets. Follett (1963a) reported their remains from the Arroyo Sequit site.

Material: 1 otolith (Fig. 16) from the 18-mesh screen.

Labridae — wrasses

Pimelometopon pulchrum — California sheephead

The California sheephead ranges from Monterey Bay to and into the Gulf of California. Throughout much of this area they abound in rocky areas, particularly where dense kelp beds grow. Unlike many fishes where the females attain the largest sizes, it is the male sheephead that grows bigger and lives longer. A record weight seems to be 36¼ pounds, but this fish was not measured. A 29-pound male was 32 inches long and appeared to be 53 years old. Sheephead will "bite" readily but are difficult to hook, because of heavy, protruding teeth and a habit of nibbling at the bait. The Chumash probably caught many sheephead on hook and line and in traps, but I feel certain they also speared sheephead while skindiving. The heavy jaws and fused pharyngeals of the sheephead have been recognized in many coastal Indian middens, including sites at Arroyo Grande, Point Mugu, Arroyo Sequit, the Century Ranch, La Jolla, San Nicolas Island, and Santa Catalina Island (Wallace, 1962; Follett, 1932; Mitchell, 1959; Follett, 1963a; Follett, 1963b; Shumway, Hubbs, and Moriarty, 1961; Meighan and Eberhart, 1953; and Meighan, 1959). Hubbs and Roden (1964) mention sheephead remains in Indian middens, but do not elaborate.

Material: jaw fragments and pharyngeals from ¼- and ⅛-inch mesh screens, and numerous teeth from 9- and 18-mesh screens.

Scorpaenidae — scorpionfishes and rockfishes

Sebastodes spp. — rockfishes

Fifty-two members of the genus *Sebastodes* inhabit the waters of California. Some of these live exclusively over rocky bottoms, others inhabit areas of sandy or sandy-mud bottom. Some live their adult lives in relatively shallow water near shore, and others live in deep water offshore. Some attain lengths of 36 inches and weights of 35 pounds and more, while others never reach 8 inches nor exceed 4 ounces. The otoliths of most of these species can be distinguished one from the other if they are from adult fish and if they are not worn or broken. Unfortunately, only one of the 12 rockfish otoliths found in Ven-3 was sufficiently entire to identify to species. It turned out to be from *Sebastodes crameri*, a species that seldom is caught shallower than 600 feet off southern California. The Chumash unquestionably fished with hook and line that deep and deeper as a matter of routine. Follett (1963a, 1963b) reported two deep-water rockfish (*S. paucispinis* and *S. goodei*) from among the rockfish remains recovered at Arroyo Sequit and the Century Ranch, and Shumway, Hubbs, and Moriarty (1961) reported the otolith of a large *S. miniatus*, another deep-water species, from the Scripps Estate Site. Hubbs and Roden

(1964) mention rockfish remains from Indian middens, but do not elaborate.

Material: 12 fragmentary otoliths (Fig. 19) most from the 9- and 18-mesh screens, although almost all unbroken rockfish otoliths would be recovered with ⅛-inch mesh.

Cottidae — sculpins

Leptocottus armatus — Pacific staghorn sculpin

The staghorn sculpin ranges from northwestern Alaska to San Quintin Bay, Baja California. They are very common in shallow outer coast waters, and in bays and lagoons. They are reported to reach lengths of 12 inches; a 10-inch female netted in 1958 weighed 8 ounces. It is difficult to keep from hooking them when fishing in areas where they abound, because they will take almost any type of bait offered and have large mouths. The Chumash probably caught them with beach seines, as well as with hook and line.

Material: the posterior portion of 1 otolith (Fig. 12) from the 18-mesh screen.

Batrachoididae — toadfishes

Porichthys notatus — plainfin midshipman

The plainfin midshipman ranges from Alaska to Magdalena Bay, usually on sandy mud or mud bottoms. South of Point Conception they seldom are found in water shallower than 50 feet, but they are very abundant from there into depths of 800 feet or more. A large male was 13½ inches long but it lacked 2 ounces of weighing a pound. The Chumash probably caught these incidentally while fishing with hook and line for deepwater rockfish.

Material: 1 otolith (Fig. 17) from the ⅛-inch mesh screen.

DISCUSSION

Speculation on Chumash Fishing Gear and Techniques

Based upon a knowledge of the gear needed to capture various species in present-day fisheries, as well as fish habits, habitats, and associations, it appears that the Chumash used several kinds of fishing gear and techniques. Various shell and bone hooks found in the Ven-3 midden are the best kind of evidence that this gear was utilized. It would have been the most productive and least cumbersome gear for catching moderate and deep-living forms (e.g., soupfin shark, spiny dogfish, California halibut, rockfish, Pacific hake, etc.). For the same reasons, hook and line would have been the most suitable gear for several schooling species that prefer offshore surface areas (i.e., bonito, barracuda, Pacific mackerel, etc.).

Although it is almost impossible to keep white croakers from taking a baited hook, the fact that most of the 7,655 white croaker otoliths looked as if they had been cast from the same mold, indicates selective gear was used to catch them. The only gear that will catch one size of fish to the exclusion of others is a gill net, and such a net having 1½- to 2-inch stretch mesh would have been ideal for taking the 7- to 10-inch white croakers that contributed their otoliths to the midden. Since the otoliths of several other species (queenfish, yellowfin croaker, jacksmelt, embiotocid perch, etc.) were from fishes that were the right sizes to have been captured in the same sized mesh, and since most of these are found in the identical habitat and at the same time, they undoubtedly were taken with gill nets also.

Several of the surf-dwelling species (surf perches, atherinids, shovelnose guitarfish, etc.) would not have been caught in any quantity without a beach seine, although anchovies (which sometimes enter the surf zone in dense schools) would have been more vulnerable to a cast net. To retain anchovies, the mesh could not exceed ½-inch stretch measure. A beach seine made entirely of such small mesh, considering net-making materials available to the Chumash, would have been extremely bulky and difficult to manipulate. None of the other surf zone inhabitants utilized by the Chumash would have been able to escape a beach seine constructed of the same mesh (or larger) as the gill net. A net with mesh that size would not have presented any problems to the Indians.

Application of similar logic points rather strongly toward the use of harpoons or spears (especially for swordfish), traps (sheephead and some rockfish), and bare hands (grunion). Thus, from available evidence, it would seem that the Ven-3 Chumash utilized hooks, gill nets, cast nets, beach seines, traps, harpoons or spears, and their hands in their fishing activities.

An Evaluation of the Fish and Mollusk Remains

The remains of 45 species of fish belonging to 27 families were recovered from Ven-3: 15 sharks, skates, and rays, and 30 bony fishes. Nineteen kinds of bony fishes (teleosts) were identified from their otoliths alone. The commonest fish remains, those of the white croaker, were represented by 7,655 otoliths, or 580 per m^3 of midden screened with ⅛-inch mesh and smaller. Since each bony fish has

two otoliths, this would represent a minimum of 290 white croakers per m^3 of midden. (This is an unrealistic hypothesis, because it assumes that both otoliths were recovered from every fish handled by the Chumash, but for the purposes of this discussion such a conclusion will suffice.) Using otolith-length/fish-length data and a length-weight chart for white croakers, it was determined that the croakers caught by the Ven-3 Chumash averaged slightly in excess of ½ pound each. Thus, the calculated 290 croakers per m^3 would have weighed 145 pounds. Witt (1960) and Priegel (1963) used similar data to calculate lengths and weights of ancient freshwater drum from otoliths found in Indian middens in midwestern and southern United States.

Experiments show that 50 per cent of the weight of a white croaker is edible (utilizable) by present-day standards, so if one assumes the Chumash had similar standards, the 145 pounds of croakers per m^3 would have yielded 72.5 pounds of protein to the Indians.

Greenwood and Browne (1969) report 42,812.5 g (94.4 lbs.) of shell per m^3 at Ven-3, and point out that this exceeds the shell content of all other sites for which comparable figures are available except on San Miguel Island. Although 66 species of mollusks were identified at Ven-3, four species, *Protothaca staminea, Tivela stultorum, Donax gouldii,* and *Tegula funebralis,* made up 92 per cent of the total shell weight recovered.

Fitch (1965a) reported that the cleaned and drained meats from 200 Pismo clams collected at Zuma Beach, California, weighed 45 pounds compared with 193 pounds for the meatless shells. The visceral masses removed from these clams weighed an additional 4 pounds, giving a total flesh recovery of 49 pounds for 193 pounds of shell or 20 per cent of the 242-pound total. Subsequent experiments indicate the ratio of meat weight to shell weight for the common littleneck is about the same as the Pismo clam, while the drained meats of bean clams weigh less than 10 per cent of the combined meat and shell weight. Using the 1:4 ratio (meat: shell), the 94.4 pounds of shell per m^3 cubic meter of the Ven-3 midden would have yielded 23.6 pounds of meats to the Indians or only one-third as much protein as was supplied by the white croakers.

Obviously, neither the white croakers nor the clams and snails in a m^3 of midden could have fed very many Indians for very long. Even when the contributions represented by shark and ray teeth, bird bones, and mammal remains are added to the total, it is clear that only a small percentage of the food items gathered by the Indians ever found their way into a midden representing perhaps several centuries of occupancy.

Use of Otoliths as Ornaments and Fetishes

Reports constantly are being circulated that American Indians used fish otoliths for making jewelry and as fetishes, but factual information on this facet of aboriginal life is generally unavailable. None of the otoliths from Ven-3 showed any drill marks such as would have been present had they been used for necklaces and other strung ornaments. Niehoff (1962) reported upon five freshwater drum otoliths (*Aplodinotus grunniens*; Sciaenidae) used as ornaments by Wisconsin Indians. Each of these otoliths had been perforated at two points, indicating that they were strung, either for a necklace or a bracelet. A Chumash necklace in the Los Angeles County Museum of Natural History, is made of drilled white seabass otoliths strung alternately with *Olivella* shells. The largest otolith (from perhaps a 40- to 50-pound fish) is at the center bottom, and each succeeding otolith to the left and right of the central one is progressively smaller. All of the otoliths on one side of the centerpiece are from the same side of the fish (i.e., all right otoliths are on one side, and all left otoliths are on the other), but not all the "matching pairs" (e.g., 4th otolith left of center and 4th otolith right of center) are from the same fish. This would indicate that the Indians (1) did not always find both otoliths in a white seabass skull, (2) lost an occasional otolith, or (3) sometimes broke an otolith during the drilling process. Finally, Walker (1951) regarded the four white seabass otoliths he found in the Malaga Cove site as "fetishes," but unless these were glossy from constant handling by the Indians or had been drilled for stringing, I would prefer thinking they were the only food-fish otoliths recovered from the Malaga Cove site — a reflection of the inadequacy of large screens for recovering enough fish remains to obtain a reasonably accurate picture of aboriginal food habits, fisheries, etc.

ACKNOWLEDGMENTS

This study was supported in part by a research grant (GB-1244) from the National Science Foundation. In addition, I received a great deal of assistance from Mrs. Roberta S. Greenwood, particularly in furnishing me with samples of "dirt" from Ven-3 in which I could search out fish remains, in looking up references to previous

archaeological investigations of Chumash sites, in making a copy of her report on Ven-3 available for my perusal, and in the helpful advice she was constantly asked to supply. Jack W. Schott took the excellent otolith photos for me; Anita Daugherty cleaned and processed many of the elasmobranch jaws I used for tooth comparisons and counts; and Shelton P. Applegate loaned me the jaws of a banded guitarfish. Mrs. Loretta Morris typed the final draft of the manuscript for me. To all these persons I offer my sincere thanks.

Literature Cited

Applegate, S. P. 1966. A possible record-sized bonito shark, *Isurus oxyrinchus* Rafinesque, from southern California. *Calif. Fish and Game*, 52: 204-207.

Baxter, J. L. 1966. Inshore fishes of California (third revision). *Calif. Dept. Fish and Game*, Sacramento. 80 p.

Collyer, R. D. 1953. The bramble shark (*Echinorhinus brucus*) at Guadalupe Island, Mexico. *Calif. Fish and Game*, 39: 266.

Curtis, F. 1963. Arroyo Sequit — LAn-52. Archaeological investigations in Leo Carrillo Beach State Park, Los Angeles County, California. *Calif. Dept. Parks and Recreation, Div. Beaches Parks, Archaeological Rept. No. 9*, 112 p.

———. 1966. Molluscan species from early southern California archaeological sites. *Bull. So. Calif. Acad. Sci.*, 65: 107-127.

Fitch, J. E. 1957. Earbones aid science, link past with present. *Outdoor Calif.*, 18(6): 10-11.

———. 1965a. A relatively unexploited population of Pismo clams, *Tivela stultorum* (Mawe, 1823) (Veneridae). *Proc. Malac. Soc. London*, 36: 309-312.

———. 1965b. Offshore fishes of California (third revision). *Calif. Dept. Fish and Game*, Sacramento. 80 p.

Fitch, J. E., and A. O. Flechsig. 1949. A brief account of the Monterey Spanish mackerel (*Scomberomorus concolor*). *Calif. Fish and Game*, 35: 275-280.

Follett, W. I. 1932. Incomplete list of fishes from Point Magu [*sic*] Shellmound. unpubl. ms, Los Angeles Co. Mus. Nat. Hist.

———. 1963a. Fish remains from Arroyo Sequit Shellmound (LAn-52), Los Angeles County, California. Appendix in: Arroyo Sequit — LAn-52. Archaeological investigations in Leo Carrillo Beach State Park, Los Angeles County, California, by Freddie Curtis. *Calif. Dept. Parks and Recreation, Div. Beaches Parks, Archaeological Rept.* No. 9, p. 113-121.

———. 1963b. Fish remains from the Century Ranch Site (LAn-227), Los Angeles County, California. *Ann. Rept. 1962-1963, Archaeological Survey, Univ. Calif. Los Angeles*, p. 299-313.

———. 1964. Fish remains from a Sixteenth Century site on Drakes Bay, California. *Ann. Rept. 1963-64, Archaeological Survey, Univ. Calif. Los Angeles*, p. 31-41.

Greenwood, Roberta S., and R. O. Browne, 1969. A coastal Chumash village: excavation of Shisholop, Ventura County, California. *Mem. So. Calif. Acad. Sci.* Vol. 8, p. 1-55.

Harrington, J. P. 1928. Exploration of the Burton Mound at Santa Barbara, California. *44th Ann. Rept., Bur. Amer. Ethnology*, Wash., D.C., p. 21-168.

Hubbs, C. L., and G. I. Roden, 1964. *Oceanography and marine life along the Pacific Coast of middle America.* Chapter 5 of vol. 1 "Natural environment and early cultures," of Handbook of middle American Indians. Univ. Texas Press, p. 143-186.

Kowta, M., and J. C. Hurst. 1960. Site Ven-15: The Triunfo Rockshelter. *Ann. Rept. 1959-60, Archaeological Survey, Univ. Calif. Los Angeles*, p. 201-217.

Landberg, L. C. W. 1965. The Chumash Indians of southern California. *Los Angeles, Southwest Mus. Pap.*, No. 19, 158 p.

McKusick, M. B. 1959. Introduction to Anacapa Island archaeology. *Ann. Rept. 1958-59, Archaeological Survey, Univ. Calif. Los Angeles*, p. 73-104.

McKusick, M. B., M. Kowta, S. Rootenberg, F. Curtis, R. Greenwood, A. Gilman, and B. Schwartz. 1961. Excavations at Goleta. *Ann. Rept. 1960-61, Archaeological Survey, Univ. Calif. Los Angeles*, p. 339-446.

McKusick, M. B., and C. N. Warren. 1959. Introduction to San Clemente archaeology. *Ann. Rept. 1958-59, Archaeological Survey, Univ. Calif. Los Angeles*, p. 107-183.

Meighan, C. W. 1959. The Little Harbor Site, Catalina Island: an example of ecological interpretation in archaeology. *Amer. Antiquity*, 24: 383-405.

Meighan, C. W., and H. Eberhart. 1953. Archaeological resources of San Nicolas Island, California. *Amer. Antiquity*, 19: 109-125.

Mitchell, E. D., Jr. 1959. Appendix IV. Faunal and human skeletal remains. p. 151-153. *In* Curtis, Freddie: Arroyo Sequit. *Archaeological Surv. Assoc. So. Calif.*, Los Angeles, Pap. 4, p. 1-169.

Niehoff, A. 1952. Otoliths as ornaments. Wisconsin Archaeologist, n.s., 33: 223-224.

PRIEGEL, G. R. 1963. Use of otoliths to determine length and weight of ancient freshwater drum in the Lake Winnebago area. *Wisc. Acad. Sci., Arts, Ltrs.*, 52: 27-35.

REINMAN, F. M., AND S. J. TOWNSEND. 1960. Six burial sites on San Nicolas Island. *Ann. Rept. 1959-60, Archaeological Survey, Univ. Calif. Los Angeles*, p. 1-134.

ROEDEL, P. M. 1953. Common ocean fishes of the California coast. *Calif. Dept. Fish and Game, Fish Bull.*, No. 91, 184 p.

SHUMWAY, G., C. L. HUBBS, AND J. R. MORIARTY. 1961. Scripps Estate Site, San Diego, California: a La Jolla site dated 5460 to 7370 years before the present. *Ann. N.Y. Acad. Sci.*, 93: 37-132.

SUSIA, M. 1962. The Soule Park Site (Ven-61). *Ann. Rept. 1961-62, Archaeological Survey, Univ. Calif. Los Angeles*, p. 157-188.

WALKER, E. F. 1951. Five prehistoric archaeological sites in Los Angeles County, California. *Los Angeles, Southwest Museum*, 116 p.

WALLACE, W. J. 1955. Archaeology of the Gilmore Ranch Site, Ventura County, California. *The Masterkey*. 29: 8-19.

———. 1962. Archaeological investigations in the Arroyo Grande Creek watershed, San Luis Obispo County, California. *Ann. Rept. 1961-62, Archaeological Survey, Univ. Calif. Los Angeles*, p. 23-66.

WISSLER, M. 1958. A Canalino site near Deer Canyon, Ventura County, California. *The Masterkey*, 32: 73-87.

WITT, A., JR. 1960. Length and weight of ancient freshwater drum, *Aplodinotus grunniens*, calculated from otoliths found in Indian middens. Copeia, 1960: 181-185.

APPENDIX B
FURTHER EXCAVATION OF VEN-3

ROBERTA S. GREENWOOD AND R. O. BROWNE

After the 1965 excavations were closed, the authors remained in touch with the municipal authorities regarding the progress of plans for the beach area. When the definitive maps were adopted in March 1967, they met with Mr. Merrell Watts, Executive Director of the Redevelopment Agency, and Mr. Charles Reiman, City Manager, to explore the possibility of obtaining funds to study the area where the bluff would be cut back for construction of the seawall. The matter was presented to the City Council at meetings on March 13 and March 20, and the Council voted to appropriate $1,000 to finance additional excavation.

Since the start of construction was imminent, the authors began the second excavation on March 22, 1967, with the following crew: Mrs. Myrle Kirk, Mrs. Elizabeth Gardner, Lisa Greenwood, Fred Smith, David Atwood, Richard Sheeler, Lory Quam and Jeffrey Noll. Only a limited amount of work could be done with the time and funds available; therefore the effort was concentrated along the threatened bluff on the eastern portion of the site. This was the area, formerly Canet property, which had not been studied in 1965, and where the burial had been found. Thirteen pits were dug using the same datum and excavation techniques employed earlier. An additional 1,563 artifacts were recovered, as summarized in Table 1. This collection is deposited in the Ventura County Museum, as stipulated by the City Council agreement.

The excavation yielded 230 items of stone, bone, and shell; 1,301 shell beads; and 32 historic objects. Rather than repeat the definitions and descriptions set forth in the main body of this report, the same classifications will be used wherever possible, with only such additional discussion as seems necessary for different or unique items. The artifacts are comparable in categories, materials, technologies, and in every way appear to be part of a homogeneous deposit. The recovery of fewer historic objects reflects a deliberate decision to shovel off and discard the overburden which was verified to be recent fill.

Features

The 1967 project contributed two additional rock features. Like those found in the first excavation, both were in the same pit at different levels, and both seemed related to fires. Feature A (1967) was encountered in the south one-half of pit S 2-E 26. It was a circular arrangement of stones, the top of which was 25 cm below the beginning of the midden, or 40 cm below the ground surface. It was composed of 60 unburned stones from 5 to 20 cm in diameter and 10 unburned stones of the same size range. The hollow circle covered an area of one square meter. Directly under this concentration, the pit yielded five tarring pebbles, two awls, one piece of pigment, and two small flaked tools. There were ash lenses to the north and east sides of the cluster, and nine tarring pebbles and two awls were recovered adjacent to the feature at the same depth. Three abalone shells containing asphaltum were found in the neighboring pit at the same level.

Figure 1. Feature B at 80 cm. with Feature A in foreground, right.

Figure 2. Feature A at 50 cm.

Feature B (1967) was a larger and more solid group of stones which filled the eastern two-thirds of the same pit. The top of the aggregation was 60 cm below the top of the midden, or 75 cm below the ground surface. It was composed of 35 burned stones between 5 to 10 cm in diameter, and 26 unburned stones from 20 to 40 cm. Several of the larger lithic components had flakes detached from the ends, although they were not discreet artifacts. The midden was continuous, and highly productive, down to the base of this feature which rested in direct contact with the sterile clay base, 10 YR 3 / 4 in Munsell color. In association with this feature were four bone tools, two lumps of hematite, two flake knives, six tarring pebbles, four cobble bar tools stained with asphaltum, and one projectile point. This pit and those adjacent to it showed heavy concentrations of shell and bone, and high artifact yield at the levels of the features. It is noteworthy that in addition to the numerous tarring pebbles and awls, both assumed to relate to basketmaking, all of the four shell containers with asphaltum and five of the six cobble bar tools were found either within the pit containing the features or those adjacent to it. Of the 68 tarring pebbles, 48 came from this specific pit alone.

Projectile Points

As in the 1965 project, the triangular form with concave base predominated, accounting for nine out of the 11 complete projectile points.

1. Narrow triangular, concave base — 9 examples (chert — 6; fused shale — 3). Edges are serrated on one specimen. Measurements are recorded for the five intact points; the others are basal fragments.

Length:	2.2-4.4 cm	Average: 3.0 cm
Width:	1.0-1.9 cm	Average: 1.3 cm
Thick.:	0.3-0.4 cm	Average: 0.38 cm
Weight:	0.6-1.8 g	Average: 1.06 g

5. Lanceolate, weakly shouldered — 2 examples (chert — 1; chalcedony — 1). The chert specimen retains traces of asphaltum below the shoulder; the other is broken off below the shoulder, but still has evidence of asphaltum.

Length:	3.0 and (est.) 3.4 cm
Width:	1.1 and 1.9 cm
Thick.:	0.6 and 0.5 cm
Weight:	1.3 and 1.9 g

7a. Tip fragments — 4 examples (fused shale — 3; chert — 1).

Blades

The four examples, three of chert and one of fused shale, are all too fragmentary to permit classification. They represent large tools in excess of 4.0 cm in length and up to 0.8 cm in thickness. All have fine bifacial edge retouch, although two retain cortex on both faces. Two show traces of asphaltum.

Choppers

1. Straight to convex working edge — 2 examples (quartzite — 1; limestone — 1). Both are wedge-shaped, retaining cortex on all sides away from the used edge. The quartzite specimen has had flakes detached from one face only to shape a slightly convex edge. The limestone chopper, smaller in size, has some rudimentary bifacial flaking.

Length:	7.6 and 8.5 cm
Width:	6.9 and 7.3 cm
Thick.:	3.8 and 5.0 cm

Hammerstones

1a. Whole cobbles — 3 examples (all quartzite).

Length:	7.0-10.9 cm	Average: 9.1 cm
Width:	6.1-8.7 cm	Average: 7.4 cm
Thick.:	5.2-7.1 cm	Average: 6.3 cm

1b. Half cobbles — 4 examples (quartzite — 3; biotite granite — 1). The two larger specimens are most likely re-used choppers.

Length:	7.5-12.3 cm	Average: 10.0 cm
Width:	6.5-11.0 cm	Average: 8.9 cm
Thick.:	5.7-8.6 cm	Average: 6.8 cm

2. Core — 1 example (quartzite). This tool is probably a re-used scraper plane.

Length:	7.6 cm
Width:	6.1 cm
Thick.:	4.4 cm

Flake Knives

1. One long cutting edge, unifacial — 2 examples (quartzite — 1; siltstone — 1). Both retain the bulb of percussion and cortex. The quartzite specimen has been retouched to form a scalloped edge.

Length:	6.2 and 7.2 cm
Width:	4.1 and 4.2 cm
Thick.:	1.2 and 2.3 cm

3. Two cutting edges, unifacial — 2 examples (both quartzite). On the smaller specimen, the two used edges are on the opposite long sides. On the larger, the working edges are adjacent, one long side and the shorter side opposed to the cortex finger-rest.

Length:	6.0 and 8.3 cm
Width:	4.0 and 7.2 cm
Thick:	1.5 and 2.4 cm

Drills

1b. Stubby, medium size — 2 examples (both chert). Both are flaked all over, and one is bipointed. Both have irregular cross sections.

Length:	2.9 and 3.9 cm
Width:	1.1 and 1.9 cm
Thick.:	0.8 and 1.5 cm

Ovoid Scraper

The sole example is a gray chert tool 2.6 cm long, 1.8 cm wide, and 0.6 cm thick. It appears to be a reworked blade fragment since two opposed edges have fine bifacial retouch, while the rest of the margin is flaked on one face only. There is cortex on both surfaces.

Side Scrapers

There were seven side scrapers (chert — 4; chalcedony — 2; fused shale — 1), four used and/or modified along one edge, and three showing wear on two edges. All were unifacial except one of the latter.

Length:	2.5-5.2 cm	Average: 4.4 cm
Width:	2.1-3.4 cm	Average: 2.8 cm
Thick.:	0.6-1.8 cm	Average: 1.3 cm

End Scrapers

Of the three specimens (chert — 2; porphyry — 1), two had working edges which were concave, and the third had a straight edge. Two were unifacially retouched.

Length:	2.2-5.0 cm	Average: 3.7 cm
Width:	1.8-3.3 cm	Average: 2.5 cm
Thick.:	0.8-1.5 cm	Average: 1.1 cm

End and Side Scrapers

The two tools of this category (both chert) are subrectangular in outline, unifacially modified along one long side and the adjacent shorter edge.

Length:	2.7 and 2.8 cm
Width:	1.7 and 2.5 cm
Thick.:	0.6 and 1.2 cm

Small Scraper Planes

The three small planes (quartzite — 2; limestone — 1) are almost triangular in cross section; the flat planing surface is cortex in two cases, with the flaked side rising steeply to the upper aspect of the tool. The under side of the third implement is a fracture plane. All working edges are slightly convex, and cover about one-half of the periphery.

TABLE 1
Total Artifact Recovery

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*70-80*	*80-90*	*Surf.*	*Total*
Stone Artifacts											
Projectile points	—	1	8	2	—	—	3	1	—	—	15
Blades	—	—	—	—	—	—	1	2	—	1	4
Choppers	—	2	—	—	—	—	—	—	—	—	2
Hammerstones	—	—	1	1	—	1	1	—	—	4	8
Knives	—	—	2	—	—	—	1	1	—	—	4
Drills	—	—	1	—	—	—	—	—	1	—	2
Scrapers	—	2	10	4	2	—	2	—	1	1	22
Bowls	—	—	—	—	1	—	1	—	—	1	3
Small mortars	—	1	2	—	—	1	—	—	—	—	4
Mano	—	—	1	—	—	—	—	—	—	—	1
Pestles	—	—	2	—	—	—	1	2	—	1	6
Cobble bar tools	—	—	2	—	—	—	4	—	—	1	7
Beads	—	—	4	—	—	—	1	—	—	—	5
Miscellaneous	—	—	—	1	2	—	1	—	—	—	4
Steatite	—	—	3	1	—	1	—	—	—	—	5
Shell Artifacts											
Beads	1	155	521	343	220	42	19	—	—	—	1,301
Ornaments	—	1	4	4	3		2	1	—	—	15
Fishhooks	—	1	5	3	1	1	1	—	—	—	12
Containers	—	—	—	—	—	3	1	—	—	—	4
Bone Artifacts											
Awls	—	—	4	4	3	—	6	2	1	1	21
Beads	—	—	—	3	3	—	—	—	—	—	6
Fishhooks	—	—	2	1	1	—	—	—	—	—	4
Miscellaneous	—	—	1	1	1	2	1	—	—	—	6
Asphaltum											
Tarring pebbles	—	6	11	5	26	8	10	—	—	2	68
Miscellaneous	1	—	1	—	—	—	—	—	—	—	2
Historic Artifacts											
Beads	2	14	11	—	1	—	—	—	—	1	29
Miscellaneous	—	—	2	—	—	—	—	1	—	—	3
Totals	4	183	598	373	264	59	56	10	3	13	1,563

The larger quartzite example is battered on the side opposite the working edge.

Length:	3.5-5.7 cm	Average: 4.7 cm
Width:	2.6-4.7 cm	Average: 3.7 cm
Thick.:	1.9-3.5 cm	Average: 2.6 cm

Used Core

One elongated core of siltstone shows both use and unifacial retouching on one straight edge, one concave edge, and both sides of the pointed tip. It is 7.2 cm long, 3.2 cm wide, and 1.8 cm thick.

Used Flakes

Five interior flakes (chert — 3; fused shale — 1; quartzite — 1) show signs of use but no deliberate modification.

Length:	1.9-4.2 cm	Average: 3.4 cm
Width:	1.1-3.4 cm	Average: 2.2 cm
Thick.:	0.9-1.3 cm	Average: 1.0 cm

Bowls

The largest of three sandstone fragments is a rim section from a vessel estimated to have been perhaps 30 cm in diameter and at least 25 cm high. The rim is straight across, 2.5 cm wide, intersecting the exterior at almost a right angle. The interior is undercut below the rim. Both inside and outside are pecked, the former more coarsely. Greatest body wall thickness, near the bottom, is 5.5 cm. The fragment is 16.0 cm wide and 22.5 cm high at present.

A body wall fragment of another large, heavy bowl measures 17.5 by 13.5 cm with maximum thickness of 7.3 cm and a minimum thickness of 3.7 cm. Exterior and interior are pecked, with some grinding visible near the presumed bottom of the inside.

The smallest fragment is a body wall section 10.2 by 8.0 cm, with thickness of 3.0 to 3.7 cm. Both sides are pecked.

Small Mortars

Four small sandstone cobbles, three whole and one broken, bear a pecked depression with evidence of battering. One specimen had some pecking on the base as well, as if to make it stand more steadily; none of the others had any further modification of the surface. On three examples, the pecked depression was centered on the upper surface, but on the fragment, the used area extended out to the margins of the stone. On the smallest mortar, the depression measures 2.5 by 3.5 cm; on the largest of the intact group, the depression is 7.5 by 7.5 cm across, and 2.0 cm deep.

Length:	7.3-14.0 cm	Average: 9.9 cm
Width:	6.8-11.3 cm	Average: 8.4 cm
Thick.:	4.2-6.5 cm	Average: 5.3 cm

Mano

One sandstone fragment may have been a mano or handstone, although there was not enough use to result in definite shouldering. There seems to be some trace of grinding on both faces. Estimated length is 12 cm, and present thickness is 5.5 cm.

Pestles

Six sandstone fragments were recovered, all assigned to the 1965 group 2, tapered cylindrical pestles. Five have been both pecked and ground into smooth, symmetrical cross section, while the sixth is pecked to shape but not ground. Of the two handle ends, one is smoothly tapered to a small convex tip 1.8 cm in diameter; the other is a convex tip 4.0 cm in diameter with a pecked depression encircling the sides 2.5 cm below the apex. The median fragment is polished very smooth and shows some battering on the smaller of the two broken ends. The three pounding end fragments are all convex, well shouldered, and ground smooth. One shows traces of hematite, and another has some asphaltum stain. Greatest diameters are between 5.0 and 6.0 cm; the longest of the fragments measures 12.7 cm.

Cobble Bar Tools

Seven four-sided, elongated sandstone cobbles otherwise unmodified show burning, battering, and/or traces of asphaltum at one end. The figure given for average length is misleading in that the broken tools omitted from the calculation would be considerably longer than the three intact specimens.

Length:	11.8-17.0 cm	Average: 13.8 cm (3 ex.)
Width:	2.2-6.0 cm	Average: 4.3 cm (7 ex.)
Thick:	1.6-3.2 cm	Average: 2.7 cm (7 ex.)

Stone Beads

Five well polished serpentine beads conform to 1965 category 1a. The diameters are 0.3, 0.35, 0.35, 0.4, and 0.4 cm. Respective thicknesses are 0.1, 0.1, 0.15, 0.1, and 0.2 cm. The perforation of the smallest bead is 0.15 cm across; the other holes are 0.2 cm in diameter.

Miscellaneous Stone Objects

One polished stone fragment with a bevel edge resembles those of the 1965 collection in material, color, and workmanship. It measures 4.6 by 3.8 cm, and is 0.6 cm thick.

Two small stone balls of near perfect sphericity but no apparent human modification were recovered. The larger is a very fine-grained sedimentary, very dark gray in color, 3.5 cm in diameter; the smaller is a whitish limestone 1.7 cm in diameter.

One object which defies classification was perhaps originally part of a sandstone milling stone, since two opposed surfaces are ground smooth. Large flakes have been detached from all other surfaces so that the piece is now long and narrow, roughly four-sided. No use is apparent, although one side bears a straight line stain of asphaltum. It is 21.7 cm long, 7.6 cm wide, and 7.4 cm thick.

Steatite Artifacts

1. Comals — 2 fragments. These are small interior pieces, both 3.5 cm in greatest plane dimension and 2.0 and 2.4 cm in thickness.

2. Vessels — 2 fragments. The larger example measures 8.4 cm along the rim, 7.0 cm down the wall from the rim, and is 2.0 cm thick. The rim is straight and 1.5 cm wide. The other piece represents a much smaller bowl only 0.8 cm thick, with a rounded rim. The fragment measures 3.7 by 3.0 cm. The exterior is decorated by two fine incised grooves encircling the vessel 0.5 cm below the rim.

3. Arrow shaft straightener — 1 example. This implement is an irregular oval in shape, one long edge probably representing the original margin of a comal and the opposed long edge being ground to match. The length is 6.7 cm, width 3.7 cm, and thickness 1.9 cm. The round-bottomed groove is 0.8 cm across and 0.5 cm deep, and extends across the short axis of the stone.

Shell Containers

Four whole shells still containing substantial amounts of asphaltum were recovered in or near the features. Three were *Haliotis cracherodii*, and the fourth was a large valve of *Tivela stultorum*. One of the abalone containers were found inverted over another of them.

Awls

A1b1. One whole example, 7.5 cm long.

A1c. Two whole examples: one deer tibia, 5.7 cm long, and one deer cannon, 12.2 cm long, with tip heavily worn down.

A1f. Four whole specimens: lengths of 6.5, 7.9, 9.2, and 13.7 cm.

A4a. One whole example, 11.7 cm long.

A5a. One whole specimen, 6.5 cm long.

Fragments — seven tips, two of them burned, and five median sections, four burned. One of the latter is made of land mammal rib, unsplit.

Flakers

There were three tip fragments comparable to those described in 1965. Two are burned. They are between 3.1 and 3.6 cm in length at present.

Bipointed Objects

Four artifacts, all with asphaltum at one end, appear to have been suitable as components of composite fishing equipment.

1. (T1a as described in 1965). Possibly made of fish bone, this piece is 2.6 cm long, with asphaltum covering ⅔ of the length.

2. Fusiform, round in cross section, 2.6 cm long and 0.6 cm in greatest diameter below the mid-point. Asphaltum stain covers about ½ the length, and the bone underneath has been transversely scored. (T1b)

3. Made of split land mammal bone, upper surface flat, 4.7 cm long and 0.7 cm in greatest width at the mid-point. Asphaltum covers one-half the length and shows impressions of cord wrapping. (T1d)

4. Circular in cross section, curved or bowed laterally, this specimen is 3.7 cm long and 0.5 cm in diameter. Asphaltum with cord impressions extends almost ⅔ of the length. (T2b1)

Antler Flaker

One short but heavy antler object with a well worn conical tip may have served as a flaking tool. The length is 4.9 cm: diameter at the midpoint is 0.9 cm.

Harpoon

One broken and eroded object is strikingly similar to the description and second illustration of Gifford's category W1 (1940), called harpoon or spear head, with long barb pointed backward. It is made of small land mammal bone, measuring 7.8 cm in length. The size and shape are appropriate to use

as a harpoon head, but the condition of the bone makes it impossible to prove human modification on this specimen.

Perforated Bird Claw

One example was recovered, 2.5 cm long and 1.2 cm wide at the perforated proximal end. It appears to be the same species as the 1965 specimen.

Bone Beads

1b. Fish vertebrae with small perforations, ground around periphery — two examples, 0.4 and 0.7 cm in diameter.

2. Hollow tubes of bird bone — three specimens. The one example which has both cut and polished ends present measures 2.9 cm in length and 0.4 cm in diameter. Two fragments with only one ground end remaining are 0.7 and 0.9 cm in length, and 0.3 cm in diameter.

Asphaltum

1. Plug — one example. This piece is conical with slight constriction below the flared end. It is 1.9 cm long and 1.0 cm in greatest diameter.

2. Pellet — one example. This specimen is a well-formed and molded consolidated ball 2.1 cm in diameter.

3. Tarring pebbles — 68 examples.

Length:	3.0-7.6 cm	Average: 5.0 cm
Width:	2.3-6.2 cm	Average: 4.2 cm
Thick.:	1.7-4.2 cm	Average: 3.1 cm

Pigment

Four lumps of hematite seem to have been molded into deliberate shapes. Under Feature A was a fragment of a round, flat cake 1.0 cm thick; the original diameter was perhaps 5.0 cm. Two pieces were associated with Feature B: a similar cake sub-rectangular in outline measuring 2.9 by 2.4 cm across and 0.8 cm thick, and the median fragment of a cylindrical stick which was 1.9 cm in diameter, and is at present 2.5 cm long. A less symmetrical lump which measured 4.0 by 3.3 by 2.9 cm was found in the adjacent pit at the 90 cm level.

Trade Beads

1b. — 1 example. Diameter 0.4 cm and length 0.3 cm.

2b. — 1 example. Like 1965 description, but not faceted. Diameter and length of 0.4 cm.

4a. — 2 examples. Diameters 0.4 cm; lengths 0.3 and 0.4 cm.

6a. — 1 example. Diameter 0.2 cm and length 0.25 cm.

c(3) — 2 examples. Diameters 0.3 and 0.4 cm; lengths 0.2 and 0.3 cm.

(4) — 11 examples. Diameters 0.3-0.4 cm; lengths 0.2-0.4 cm.

d(1) — 9 examples. Diameters 0.3-0.5 cm; lengths 0.3-0.4 cm.

(2) — 1 example. Diameter 0.55 cm and length 0.3 cm.

g. — 1 example. Bright blue, opaque, asymmetrical tear-drop shape with lumpy surface and indented perforation at narrow end. Width at broad end 0.9 cm and length 1.2 cm

Miscellaneous Historic Objects

One fragment presumed to be Mission tile was recovered. Orange-red in color with very dark gray core and one straight edge, the piece is flat and may represent floor tile. It measures 5.1 by 3.9 cm at present, with thickness of 2.3 cm.

The rim, neck, and shoulder of a bottle similar to those in use around 1880 was found. It is bubbly aqua glass blown in a two-part mold with drawn neck and applied lip. It has a short neck only 2.9 cm long including the rim, and round body. One square cut nail was 6.3 cm long with a shank 0.5 cm wide and 0.4 cm thick.

Midden Components

Analysis of selected shell samples demonstrated a distribution of species and quantity comparable to that described in the 1965 report. All otoliths were collected from the ⅛ inch screens. Disregarding the overburden which varied from 10 to 15 cm in depth and was discarded, the total of 2,985 otoliths represented an average of 389 examples m^3 of midden (Table 2). The collection was identified by Mr. John E. Fitch, who added one previously unreported species, *Roncador stearnsi* (spotfin croaker), to the list he found in the earlier sample.

CONCLUSIONS

The area investigated in 1967 is in all respects part of the same site excavated earlier. The second project revealed two additional rock features with associated awls, tarring pebbles, cobble bar tools,

and shell containers with asphaltum, suggesting once again that this particular assemblage is related to basketmaking. The predominance of triangular projectile points with concave base over leaf-shaped forms at this site was confirmed. The excavation produced a fine collection of artifacts for local display, including a number of unbroken awls and a varied assortment of shell items. The use of *Astraea undosa* for fishhooks, suggested by the blanks found in 1965, was demonstrated by the two completed specimens found in 1967.

It was the foresighted action of the Ventura City Council and Redevelopment Agency which made this study possible, and it is to their credit that they assumed this responsibility in advance of the destruction of Shisholop.

TABLE 2
Otoliths and Teeth

Otoliths		
Genyonemus lineatus	White croaker	2,974
Seriphus politus	Queenfish	5
Sphyraena argentea	California barracuda	3
Sebastodes sp.	Rockfish	1
Phanerodon furcatus	White seaperch	1
*Roncador stearnsi**	Spotfin croaker*	1
		2,985
Teeth		
Raja spp.	Ray	21
*Prionace glauca**	Blue shark*	1
Galeorhinus zyopterus	Soupfin shark	1
		23

*not found in 1965 excavation.

TABLE 3
Distribution of Shell Beads

Category	*0-10*	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*Total*
I A 1	—	—	2	3	—	—	—	5
2	—	22	78	59	22	4	—	185
3	—	114	372	228	160	28	13	915
4	—	3	6	4	7	2	1	23
5[1]	—	—	9	3	—	1	—	13
B	—	1	2	—	—	1	—	4
C	1	5	13	10	8	2	2	41
E[2]	—	—	—	2	—	—	—	2
II A	—	—	5	7	5	—	—	17
B	—	6	26	22	14	2	1	71
E[3]	—	1	—	—	—	—	—	1
F[4]	—	1	—	2	—	—	—	3
III A 2	—	1	2	—	2	—	—	5
3	—	1	1	—	—	1	—	3
B 2	—	—	2	—	—	—	—	2
IV	—	—	2	—	1	—	1	4
V	—	—	1	—	—	—	—	1
VI[5]	—	—	—	—	—	1	—	1
IX	—	—	—	1	—	—	—	1
X[6]	—	—	—	2	1	—	—	3
XII[7]	—	—	—	—	—	—	1	1
Totals	1	155	521	343	220	42	19	1,301

[1]Incised with oblique parallel lines — 5; cross-hatched pattern — 8. All but one have asphaltum.
[2]Whole *Olivella bi.* with one punched hole on body wall.
[3]*Mytilus calif.* disk, large size.
[4]*Mytilus calif.* disk, very small size.
[5]Biconically drilled through at broader end.
[6]Two examples, 0.7 and 0.8 cm long, and one nearly whole shell, 3.8 cm long, with margins trimmed away.
[7]*Acmaea* sp. with apex ground off, 0.9 by 0.7 cm in size.

TABLE 4

Distribution of Shell Ornaments and Fishhooks

Category	*10-20*	*20-30*	*30-40*	*40-50*	*50-60*	*60-70*	*70-80*	*Total*
Ornaments								
4 a[1]	—	2	—	—	—	2	1	5
b[2]	—	—	—	1	—	—	—	1
h[3]	1	1	1	2	—	—	—	5
j[4]	—	—	2	—	—	—	—	2
5[5]	—	1	—	—	—	—	—	1
6[6]	—	—	1	—	—	—	—	1
								15
Fishhooks								
I A 2	—	—	—	—	—	1	—	1
3	1	1	1	—	—	—	—	3
4	—	—	1	—	—	—	—	1
II B	—	3	—	—	—	—	—	3
III A	—	1	1	—	—	—	—	2
IV[7]	—	—	—	1	1	—	—	2
								12

[1]Diameters: 0.5 — 1.4 cm.

[2]Diameter: 2.9 cm.

[3]One example trapezoidal, 0.6 by 1.1 cm ; one trapezoidal, 2.0 by 2.7 cm; two round, 0.8 and 1.9 cm in diameter; one unfinished, ca. 2.0 cm.

[4]One fragment of spangle (?), one perforation present, broken through second perforation, 0.9 cm long; second fragment broken through sole visible perforation, 0.6 cm long.

[5]*Tivela stultorum,* undrilled blank, edges ground, 1.8 cm diameter.

[6]*Forreria belcheri,* whole shell, three cut or punched holes (natural ?), 9.7 cm long.

[7]*Astraea undosa,* large size (+ 3.0 cm), grooved shank.

MCZ ERNST MAYR LIBRARY
3 2044 135 017 028

Date Due

SEP 1975

SEP 1975

AUG 31 1989

MAR 31 1996

JUL 22 2004

JUL 19 2005